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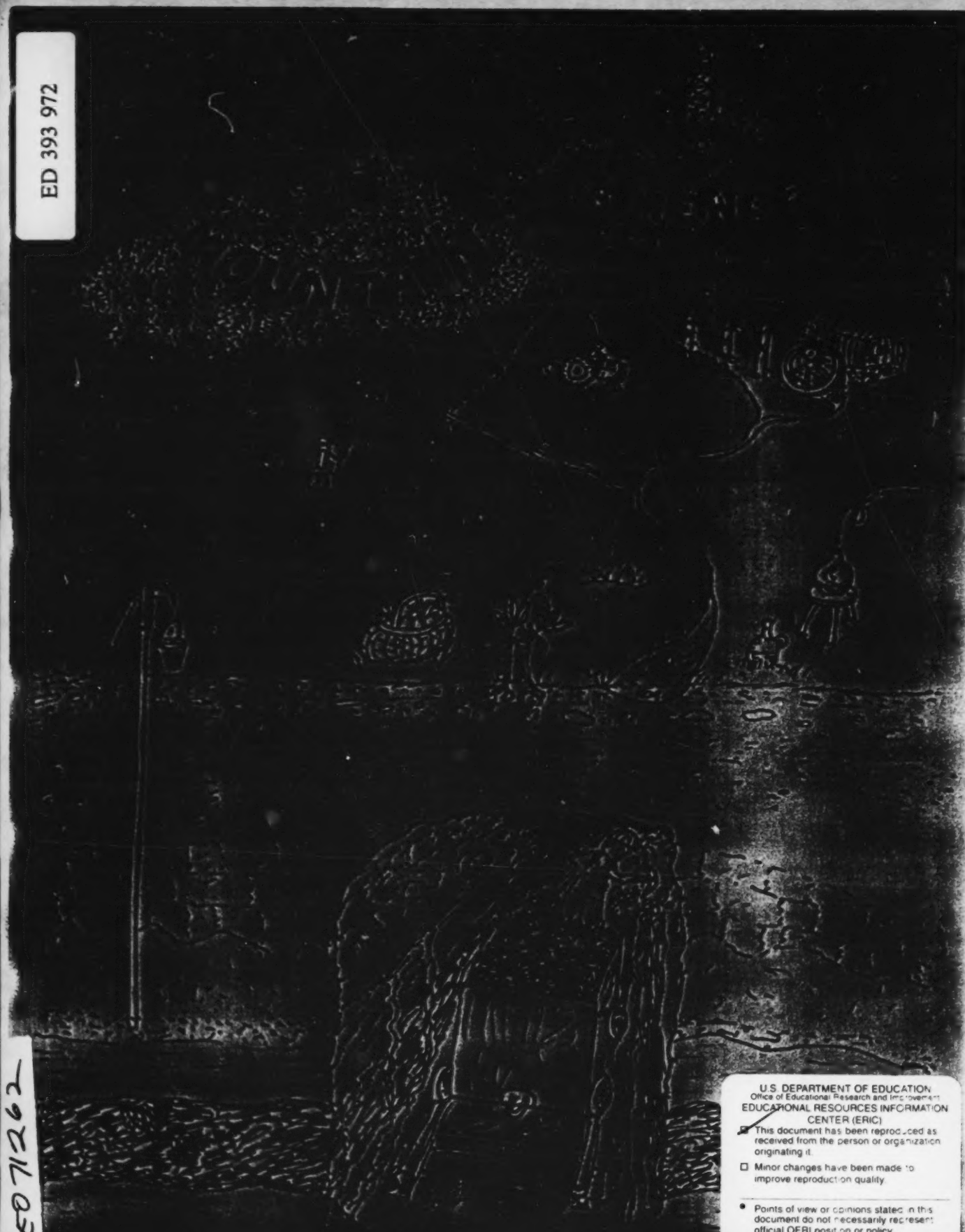
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ABSTRACT

This is the second in a series of books that provide high-interest reading material for rural adults who read below the seventh-grade level. The book provides information on science, technology, and the environment for the people of Appalachia and other rural areas, helping to bring the concepts and meaning of science within their grasp. Many of the articles are first-hand accounts of science as practiced in earlier times by ancestors of the storytellers. Revised and updated from the first edition, this edition is relevant to adults with low reading levels beyond the Sequatchie Valley area of southeastern Tennessee that was emphasized in the first edition. The book is printed in large type in order to help adult readers who have vision problems, and where appropriate, stories are written in modified vernacular form. Words in italics are explained at the end of each story. The reading levels are based on the Fry Graph for Estimating Readability, the Dolch Word List, and lists of most-used words. Reading levels range from first through sixth grade. Stories in Part One have a controlled vocabulary and all new words are listed. The 52 stories are organized in eight parts: (1) science and people; (2) water--you can't do without it; (3) power and people; (4) earth science; (5) our forests; (6) herbs and healing; (7) guns and hunting; and (8) the meaning of science. (KC)

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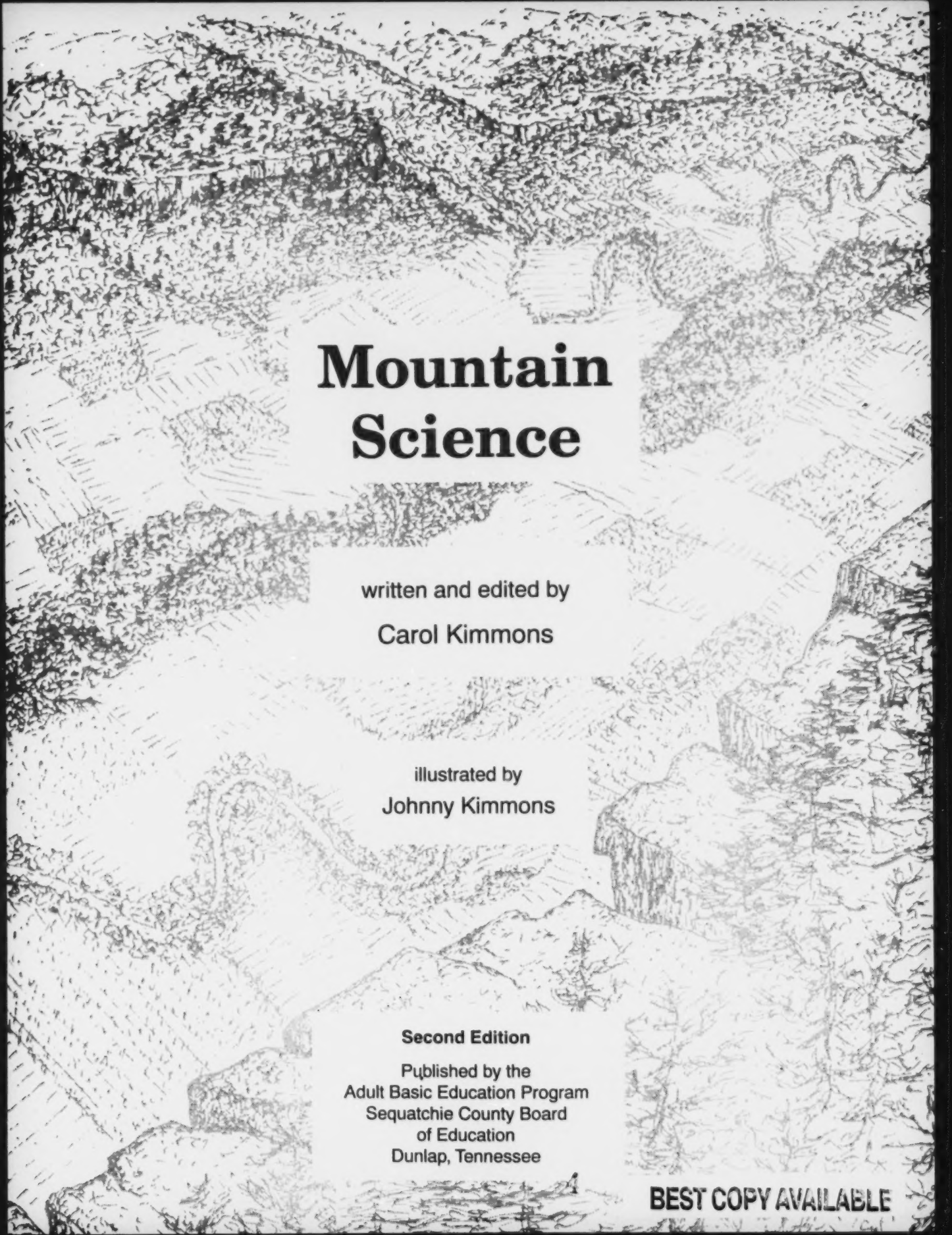
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Mountain Science



Mountain Science

written and edited by
Carol Kimmons

illustrated by
Johnny Kimmons

Second Edition

Published by the
Adult Basic Education Program
Sequatchie County Board
of Education
Dunlap, Tennessee

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To Dr. Sandra Wilson, for her support and perseverance.

To the people who provided technical information: Michelle and Jeff Sims, James Long, Don Edgmon, Richard Ebata, John Christoff, Gene Reid, the Pilkingtons, and many others.

Credits

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Photographs courtesy Carson Camp Art & Photo.

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Printed in the USA on 50% recycled paper.

This book is dedicated
to the
spirit of science
in
every person

With special gratitude to the people who shared
their lives and work with me.

Charlie Clark
Podney Jones
Clyde Ketner
Arley Laymon
James Long
Mae McDowell
Randy Studer
Ines and Johnnie Tucker
D. Wooden

and in remembrance of Elmer Marsh,
who died on March 2, 1986.

Preface

Mountain Science is the second in a series of books which provide high-interest reading material for rural adults who read below the seventh-grade level. The first book in the series is *The Mountain Reader*, which covers subjects of general interest and everyday social needs.

Mountain Science provides pertinent information on science, technology, and the environment for the people of Appalachia and other rural areas. It helps bring the concepts and meaning of science within their grasp. It is not intended to be a science text or a complete reading program.

The first edition of *Mountain Science*, published in 1986, emphasized the Sequatchie Valley area of southeastern Tennessee. However, *Mountain Science* rapidly gained an audience far beyond the valley. The appeal of this book for rural adult beginning readers has resulted in requests from literacy programs in many locations. The second edition of *Mountain Science* has been revised and up-dated to increase its relevance for readers everywhere. Instructors may wish to have students add supplemental information from their own area.

The book is printed in large type in order to help adult readers who have vision problems. Where appropriate, stories are written in modified vernacular form. Words in italics are explained in the *Information, Please* sections at the end of each story.

The reading levels are based on the *Fry Graph for Estimating Readability*, the Dolch Word List, and lists of most-used words. Reading levels range from first through sixth grade. Stories in Part One have a controlled vocabulary and all new words are listed.

References

- Fry, E., "A Readability Formula That Saves Time," *Journal of Reading*, 11, No. 7 (1968), 514-515.
Kucera, Henry, and W. Nelson Francis, *Computational Analysis of Present-Day American English*, Brown University Press, 1967.

Reading Levels

Water and People	1	Pass the Gunpowder	5
Power and People	2	Fun and Danger in the Dark	6
Rocks and People	1	A Cave Rescue	2
Trees and People	2	Savage Gulf	5
Plants and People	1	The Gulf Keeps Its Secrets	2
Guns and People	1	The Use of Trees	5
Maps and People	2	Paper from Trees	5
Science and People	1	When the Mountains Burned	2
Water from the Mountain Springs	2	Wildfires Today	3
Dig Deep	2	Mountain Medicine	2
Finding Water - A Gift of God	1	The Magic Herb	2
Clean Water for Towns	5	Midwives and Granny-Women	5
"Think It'll Rain?"	3	Blood and Warts	2
Floating down the River	4	Guns, Guns, Guns!	2
Water and Corn	2	Kids and Guns	2
Water for Power	4	Hunting and the Law	5
Ketner's Mill	4	Hear Those Dogs?	2
Let There Be Light!	6	Hunting the Wild Snipe	2
Electricity From Steam	4	The Fear of Science	6
What Made the Rocks?	4	Everyone Is a Scientist	4
The Mountains Rise	3	George Cagle: An Early Sequatchie Valley Scientist	2
Black Gold	6	Podney - A Modern Scientist	3
Modern Coal Miners	4	Think Like a Scientist	3
The Coke Ovens	3	Science Mysteries	4
The Sand Pits	3	Problems of Science	6
Holes in the Limestone Rock	5	The Price We Pay	6

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PART ONE

Science and People

Water and People



This is a spring.
The water is from the spring.
The water is good.

water
and
people
this
is
a
spring
the
water
from
good

Mae
looks
for
she
wants
well

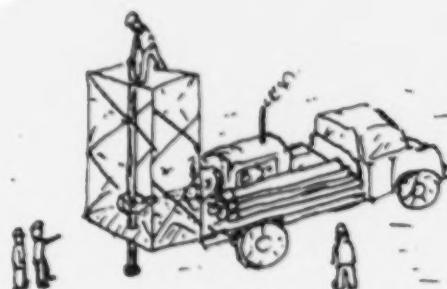
This is Mae.
Mae looks for water.
She wants a well.
She wants good water.





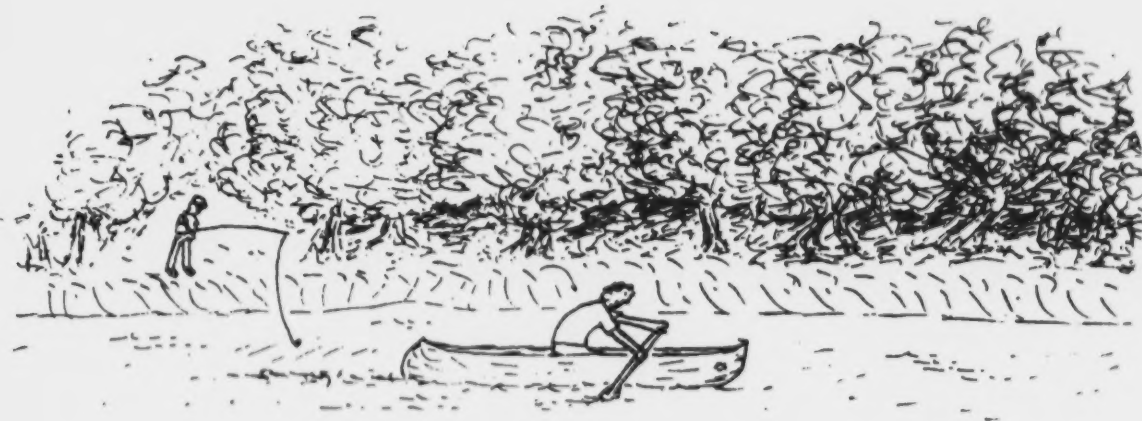
This is Elmer.
He is digging a well.
The well is for water.

Elmer
digging



They are drilling a well.
It is deep.
The water is very good.

They
are
drilling
deep
it
very



This is a canoe.

This is the river.

The canoe is on the river.

People like to go in a canoe
on the river.

canoe
river
on
like
to
go
in



This is a town.

The town is Dunlap.

Dunlap water comes from the river.

The river water is not clean.

People want clean water.

The river water goes to the water plant.

The water plant cleans the water.

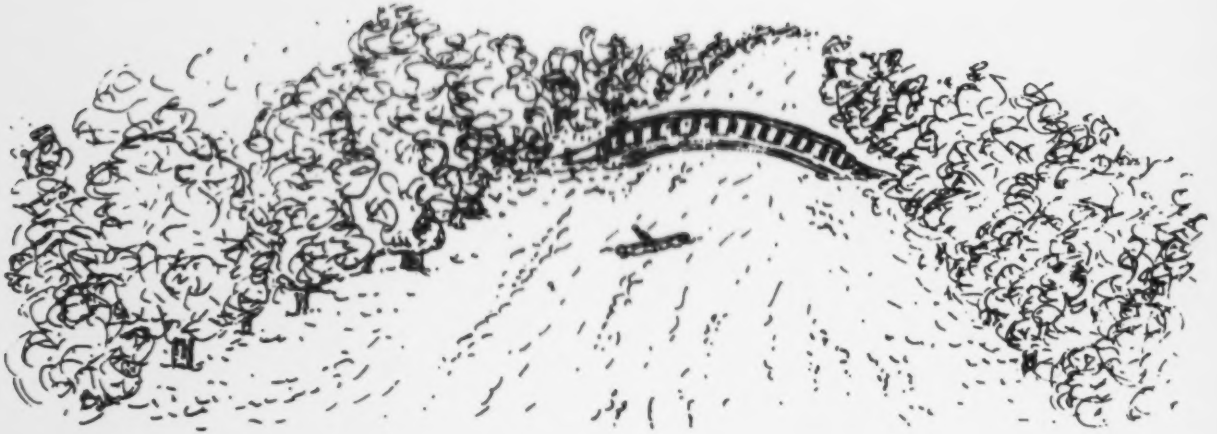
The clean water goes to the houses.

town	clean
Dunlap	goes
comes	plant
not	houses



It is raining.
It is raining in Dunlap.
The rain is good for the farms.
It is good for the corn.
It is good for the springs and wells.
Some people don't like the rain.
They want it to stop.

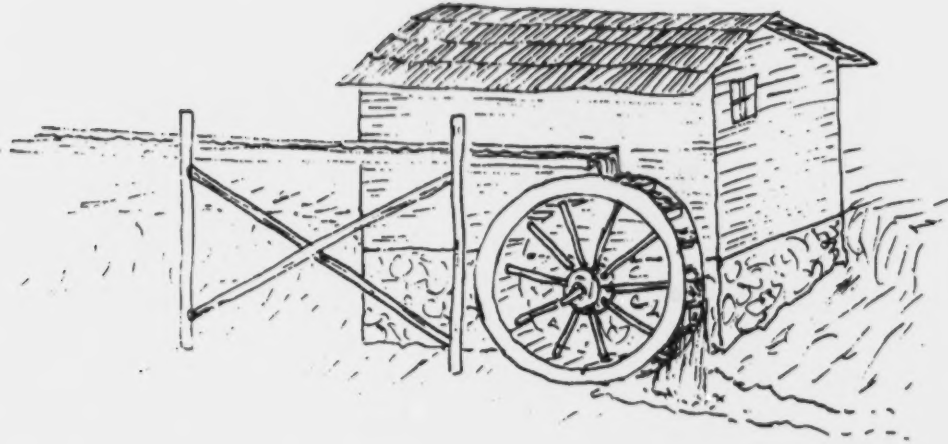
raining
farms
corn
some
don't
stop



flooding

This is the river.
The river is flooding.
The water is deep.
The water is in Dunlap.
The people look at the water.
It is in the houses.
The people don't like the water.

Power and People



power
mill
has
wheel
turns
makes
meal
bread

This is a mill.

The mill is on the river.

The mill has a water wheel.

The river turns the water wheel.

The mill makes corn meal.

The corn meal makes good bread.

This is a dam.

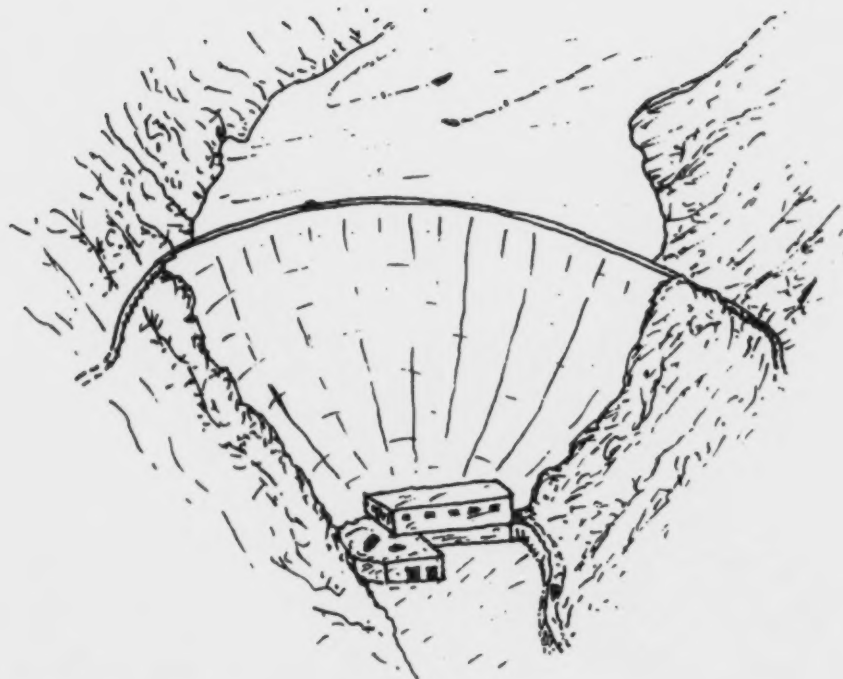
The dam stops the river.

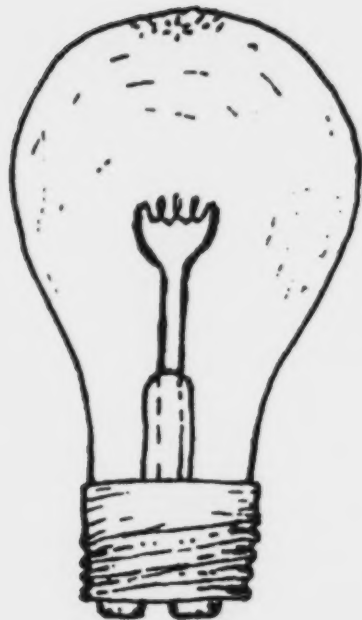
The dam makes a lake.

People like to water ski on the lake.

The dam makes electricity.

dam
lake
ski
electricity





light
bulb
work
through
giant
called
turbines
generators

This is a light bulb.

Electricity makes it work.

The electricity comes from the dam.

The water goes through the dam.

It turns giant wheels.

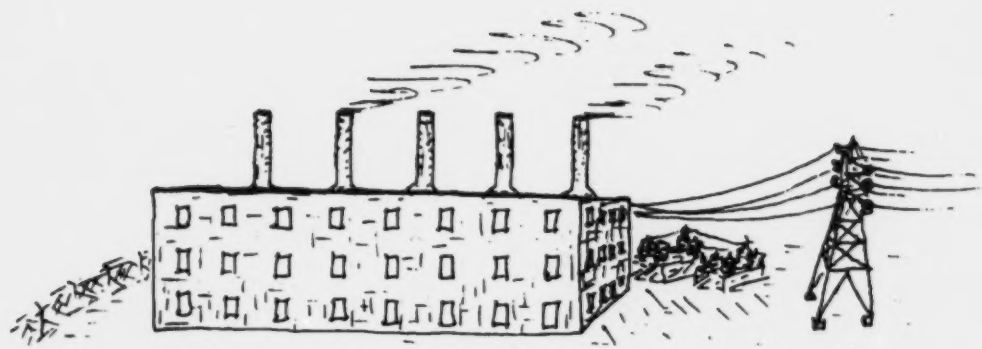
The giant wheels are called turbines.

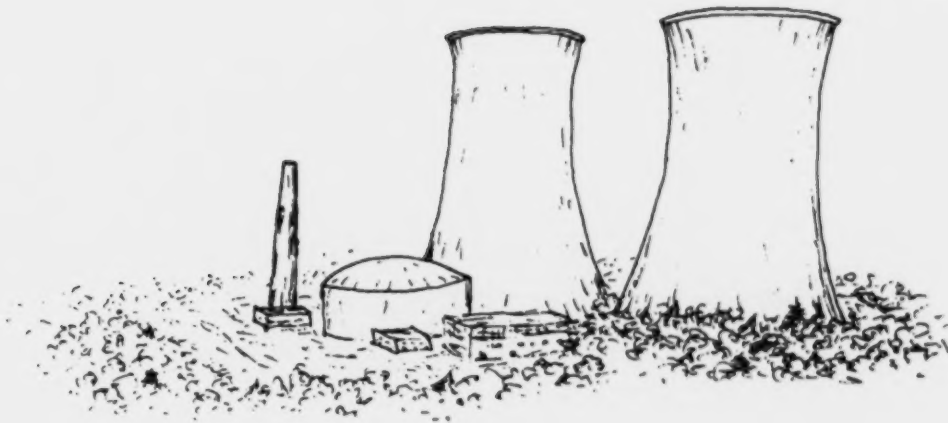
The wheels turn generators.

The generators make electricity.

This is a power plant.
This power plant burns coal.
The coal heats water.
The water makes steam.
The steam turns turbines.
The turbines turn generators.
The generators make electricity.
Smoke from this plant may
make pollution.

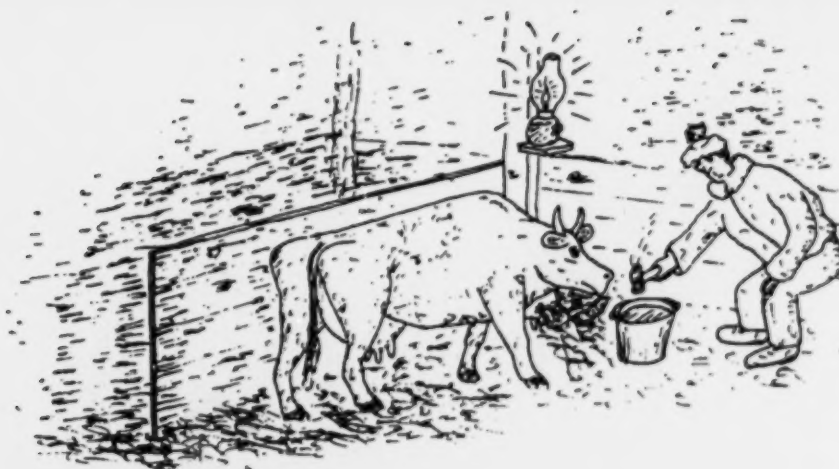
burns
coal
heats
steam
smoke
may
pollution





nuclear

This is a nuclear power plant.
The nuclear power heats the water.
The water makes steam.
The steam turns turbines.
The turbines turn generators.
The generators make electricity.
The electricity goes to people's houses.



Dan has a big farm.

He has a barn.

He has cows.

He doesn't have electricity
in the barn.

It is dark when he milks.

It is cold.

The water is cold.

The cows don't like the cold water.

Dan wants electricity in the barn.

Then he will have lights.

Then he will heat the water.

The cows will like the water.

Dan will like the lights.

Electricity will be good for Dan
and the cows.

Dan	dark
big	when
barn	milks
cows	cold
doesn't	will
have	then

Rocks and People

This is a coal mine.

The coal is deep in the ground.

The miners dig down through the rock
to the coal.

Then they dig the coal.

It's hard work.

It's dark in the mines.

The miners get very dirty.

They get good money for the work.

The coal goes to the power plant.

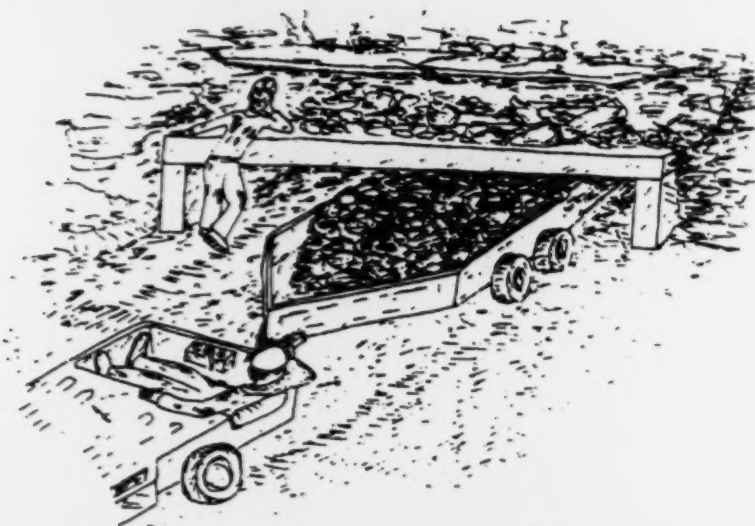
The power plant burns the coal.

It makes electricity.

Some people burn coal to heat houses.

rocks
mine, miner
ground
down

it's
hard
get
dirty
money





They used to make coke in Dunlap.

They made it in the coke ovens.

These are the old coke ovens in Dunlap.

They make coke from coal.

They burn the coal in ovens.

The ovens are closed.

The ovens get very hot.

The coal turns to coke.

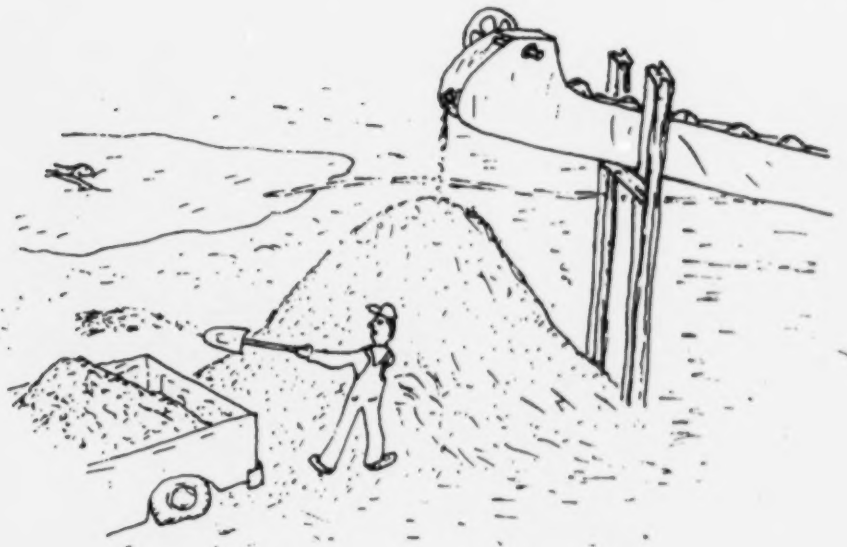
Coke is hard.

It burns very hot and clean.

They use coke to make steel.

use, used
coke
ovens
these
old
closed
hot
steel

This is the sand pit.
Elmer is digging the sand.
It's good sand.
It is clean.
People use the sand to build houses.
They use the sand to make concrete.



sand
pit
build
concrete



cave
Indians
tools
hunting

This is a cave.

Some people like to go in caves.

Some people don't!

Some Indians used caves for houses.

Some people find Indian tools
in the caves.

The Indians used the tools for hunting.

They used the tools for digging.

They used the tools to plant corn.

Trees and People

This is an old forest.

The trees are very big.

They are very old.

They are in Savage Gulf.

Many animals live in this forest.

The Indians used to live in the forest.

They liked to hunt animals

in the forest.

They hunted the animals for food.

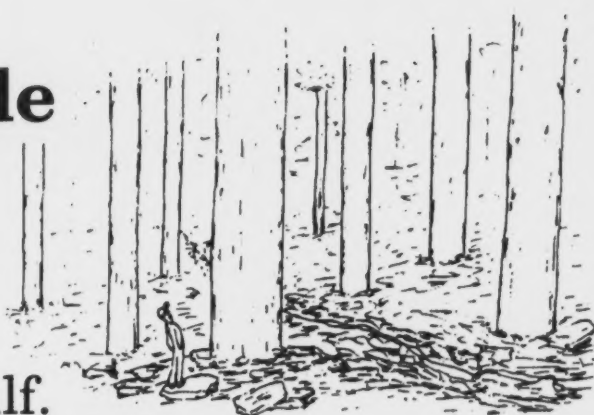
They used some of the trees in the
forest to build houses.

They used some of the trees to heat
houses.

People still use trees to build houses.

They still use trees to heat houses.

People still like to hunt animals
in the forest.



trees	animals
forest	live, lived
Savage Gulf	food
many	still

Jeff is a forester.

He helps people with their forests.

He tells people how to plant trees.

He knows which trees grow well
in Tennessee.

He has many new ideas about
taking care of forests.

He helps keep the forests beautiful.

He knows how to stop forest fires.

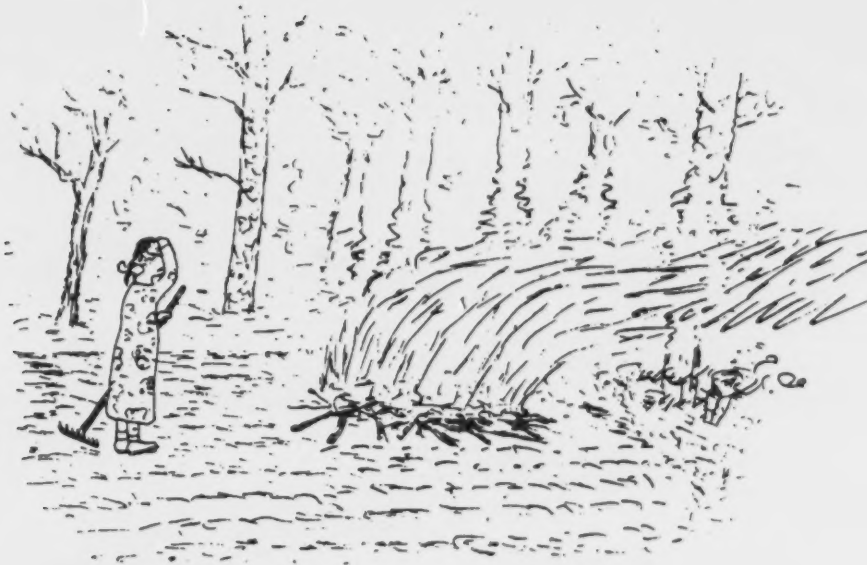
He helps stop erosion.

Jeff protects the animals and
plants in the forest.

knows
which
grow
Tennessee
new
ideas
care

keep
beautiful
fires
erosion
protects





Mae is digging in her garden.
She is burning the old plants.
She wants her garden to look good.
But the woods are very dry.
It hasn't rained.
It is very windy.
The fire could get away from her.
It could get into the forest.
If it does, they will have to
 get Jeff, the forester.
He will get a helicopter.
The helicopter will drop water
 on the fire.
The water will stop the fire.

her
garden
but
woods
dry
windy

could
away
into
if
helicopter
drop

Plants and People

Mae is in the forest.

She is digging plants to make
medicine.

She knows all the trees and plants.

She knows the trees and plants
that are good for people.

Some plants can heal sick people.

Some plants are good to eat.

Some people know which plants
can heal.

Some people still use plants for
medicine.

medicine
heal
sick
eat



Guns and People

Elmer works at the sand pits.

He digs sand.

He works hard.

He has many tools.

He uses his tools to do his work.

One night a man came to the
sand pits.

He took Elmer's tools.

Elmer was very mad.

He wanted his
tools back.

Elmer got his gun.

He went into the
woods.

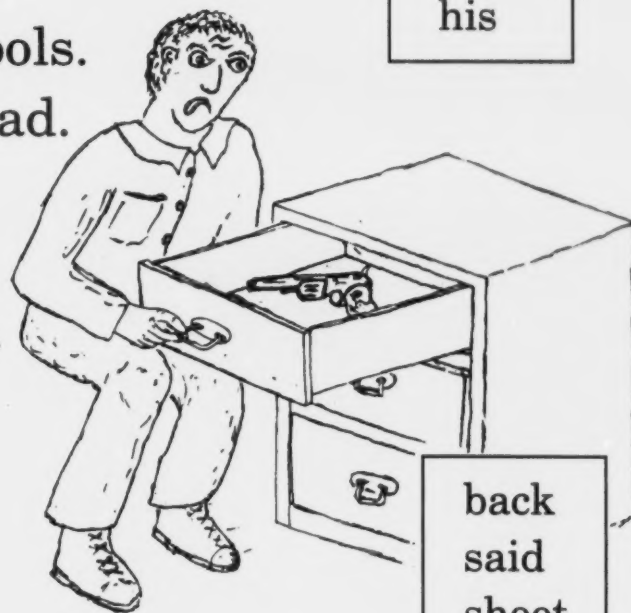
He said, "I will
shoot him if he
comes back."

The man didn't come back.

Elmer was happy.

He didn't really want to shoot the man.

guns
one
night
man
came
took
mad
his



back
said
shoot
him
happy
really

Some people like guns.
Some people don't like guns.

Elmer likes guns.
He says, "I need a gun.
I use a gun to hunt.
I hunt birds and deer.
I use them for food."

says
need
birds
deer
them
farmer
groundhogs

Dan likes guns.
He says, "I am a farmer.
I need a gun to shoot groundhogs.
The groundhogs eat the corn.
They dig in the corn."



Mae likes guns.
She says, "I like guns.
Jan and I live in the woods.
If I hear someone at night,
I get the gun.
No one will steal from us.
I will shoot them!"

Mary doesn't like guns.
She says, "People can
get hurt with guns.
Guns can kill people.
I don't want to kill people.
If I hear someone at night,
I will call the police."

Jan
hear
someone
no
steal
Mary
hurt
kill
police



Maps and People

This shows direction.

N is north.

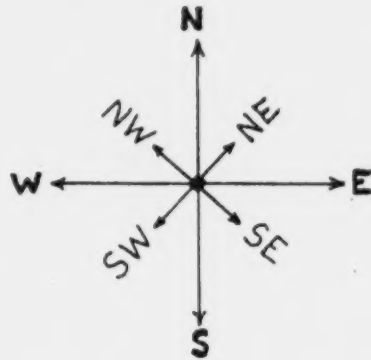
S is south.

E is east.

W is west.

NE is northeast.

SE is southeast. NW is northwest.



Look at the map on page 26.

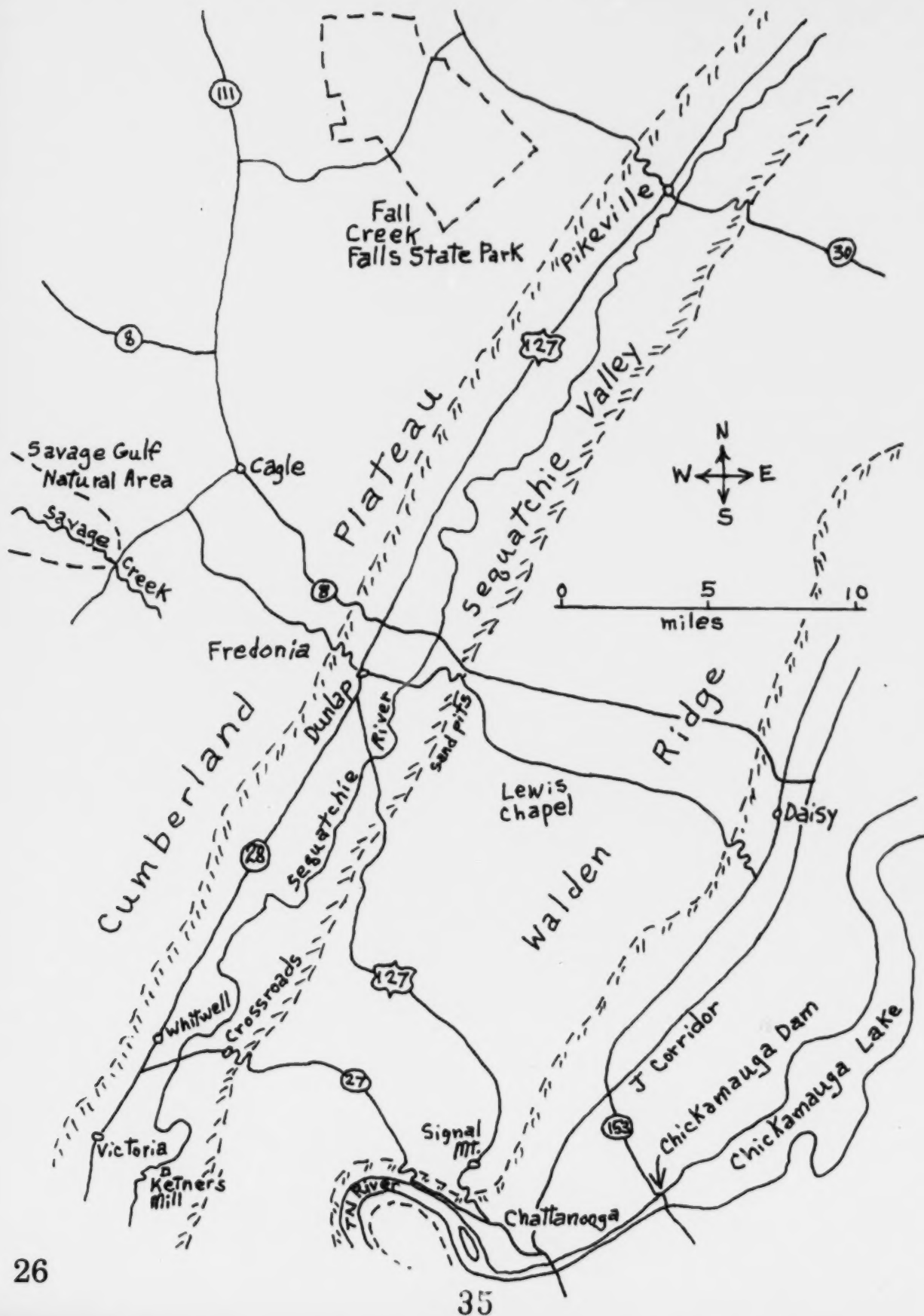
It is a map of the Sequatchie area
of Tennessee.

Find the Sequatchie Valley.

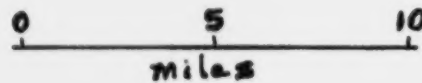
It is about 50 miles long and
4 miles wide.

It runs from the northeast
to the southwest.

maps	area	miles	runs
page	find	long	shows
Sequatchie	Valley	wide	direction



This scale shows the miles on the map.



Find Dunlap.

Find Whitwell.

Whitwell is southeast of Dunlap on
Highway 28.

Is it more than 10 miles from Dunlap to
Whitwell?

How far is it?

Find Pikeville.

It is northeast of Dunlap on Highway 127.

Find Chattanooga.

Find Chickamauga Dam.

Find Savage Gulf.

Find Fall Creek Falls.

Find Ketner's Mill.

Where can you canoe?

Where can you water ski?

scale
highway
more
than
far
where
hike

Where can you get sand?
Where can you hunt?
Where can you hike?
Where are the big old trees?
Find the Cumberland Plateau
and Walden Ridge.
They run along the valley.
The bottom of the valley is
about 1000 feet below the plateau
and the ridge.
Find the Sequatchie River.
How long is it?
What direction does it run?
Part of the Tennessee River
is on the map.
Find it.
It runs through Chattanooga.

plateau
ridge
along
bottom
part

Science and People

Do you like trees?

Do you like to hunt?

Do you like to canoe on rivers?

Do you like to go in caves and mines?

Do you like to plant a garden?

Do you like rocks?

Do you want to know more about
how things work?

If you do, then you like science.

You can learn more about science.

You can read about forests, rocks,
mines, and caves.

You can look at plants and animals.

You can think about new ideas.

You can talk to people
who know about science.

There are many new things
to learn about science.

Keep learning!

things
science
can
learn
read
think
talk
who

PART TWO

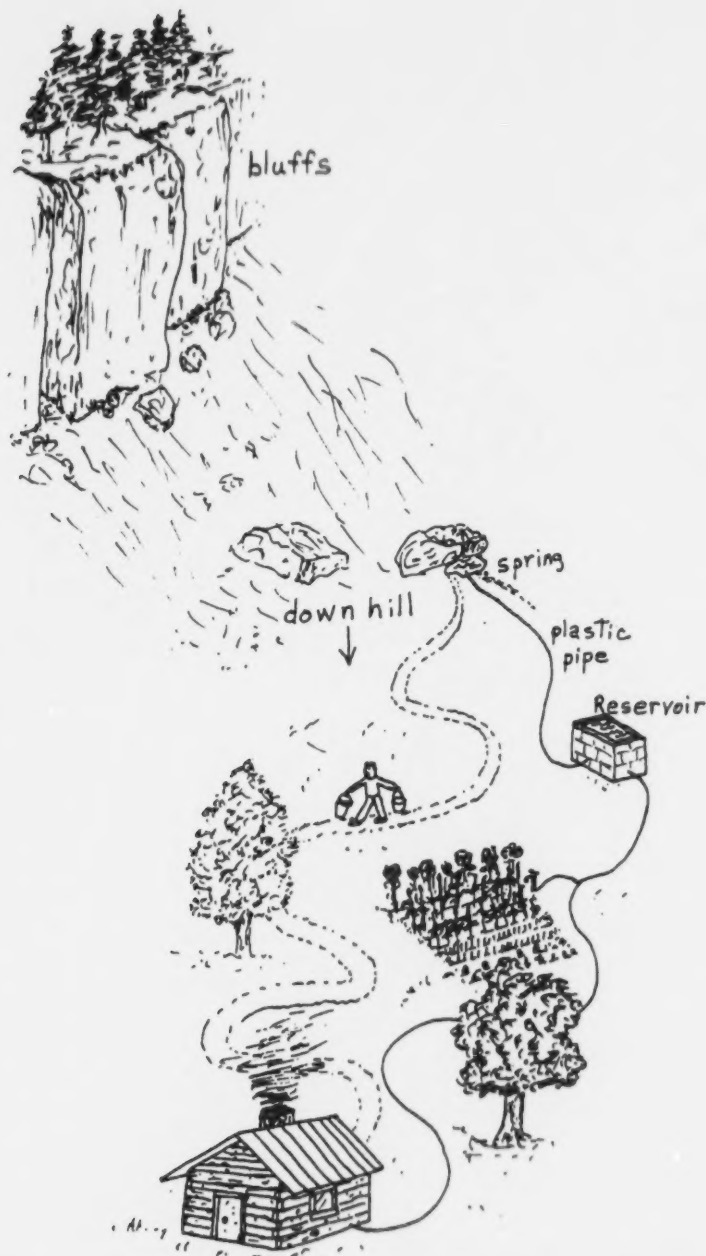
Water
You Can't Do Without It

Water From the Mountain Springs

People can't live without water. They need it to drink, to cook, and to wash. The first *settlers* had to have water. So they built their homes near springs. Springs are places where water comes out of the ground. Even today, people are proud to have a good spring. Nothing tastes as good as cold spring water.

People used to carry water to their homes in pails. That was a lot of work. People sometimes made pipes out of logs. They ran the water from the spring into the house through the logs. But they didn't have pumps. The spring had to be higher than the house. They called this *gravity* water. Gravity makes the water run downhill.

Now people can buy cheap black plastic pipe. It's easy to run the water down a mountain. If the spring is up too high, there's a problem. There's too much *pressure*. You can't turn the water off! The pipes would blow apart. So people just let it run all the time. That keeps it from freezing in the winter, too. Sometimes people run the water into a concrete tank or *reservoir* above their house. They run another line to the house. Then they can turn off the water in the house.



Sometimes spring water isn't safe to drink. Animals and leaves may get in it. It's better to build a concrete box over the spring. This keeps the water clean.

Information, Please

settlers – people who move to a new place or country

- Before the 1800's, only Indians lived in the Sequatchie Valley. About 175 years ago, many families from the eastern U.S. and from Europe moved to Tennessee. They came to find new farm land to settle. Many of these **settlers** came from Virginia, South Carolina, North Carolina, and Maryland. Most of their parents had come to America from Germany, Scotland, Ireland, England, and Switzerland.

gravity – the force that causes things to move toward the center of the earth

- If you shoot an arrow into the sky, **gravity** will pull it back down.

pressure – a push or a force on things

- If you swim down deep under the water, you feel the **pressure** of the water on your body.

reservoir – a place where water is stored

- A water **reservoir** is useful in case of fire or dry weather.

Dig Deep

Settlers didn't always have a spring near their farm. Some had to dig a well. The water in wells is called ground water. It comes from rain that slowly sinks deep under the ground. It gets trapped in layers of rock and gravel. Sometimes this water is not very deep. Some wells reach ground water in just 20 feet. But this water may not be safe to drink. Sometimes a septic tank, barn, or outhouse is near the well. Hard rain might wash germs down through the ground and into the ground water.

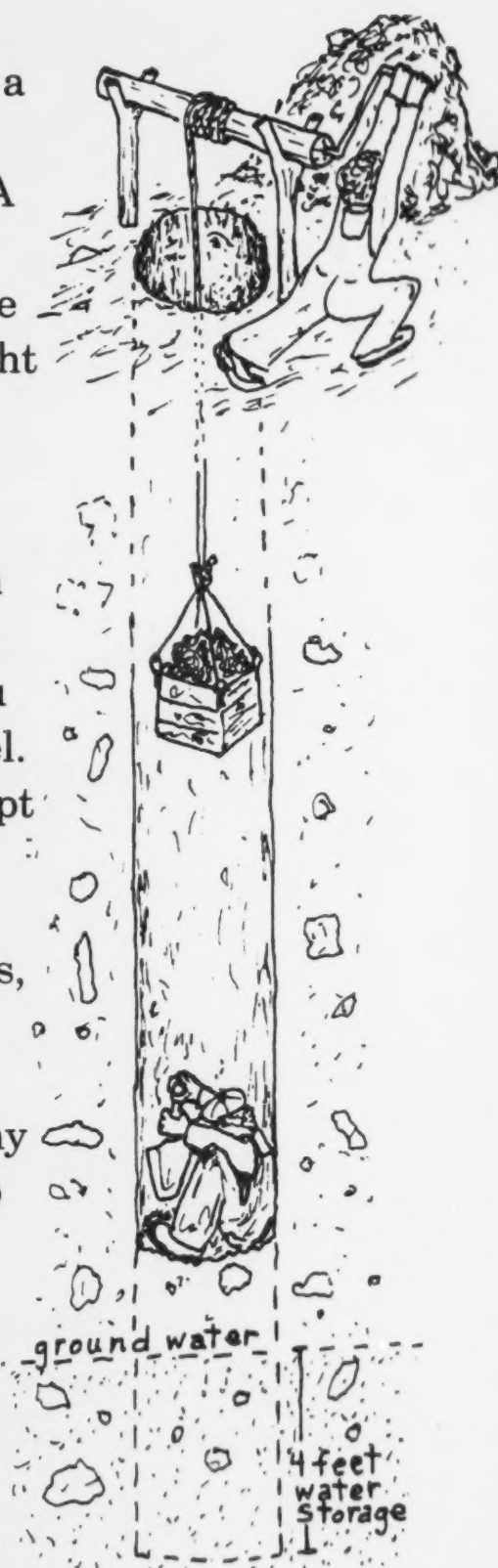
Today, they drill deep wells. They put heavy metal pipes down. Some of these wells are over 500 feet deep. Well drillers charge for every foot they drill. They don't always find water. It may cost a lot for a dry hole. A 500-foot well might cost over \$5000. Water this deep is safe to drink. But it may have iron or sulphur in it. They give the water a bad taste. The iron turns clothes and wash basins red.

People used to dig wells by hand. It was hard and dangerous work. Elmer Marsh is a brick mason. He used to dig wells and brick them up inside.

Elmer Marsh: "That used to be a trade of its own. I've never done much of it. It's a dangerous job. A man had to know what he was doing or he'd get killed. I saw one man get covered up with dirt right to his neck. He was scared to death. But they got him out.

"The men on top would send down buckets on ropes. The man down in the well would fill them with dirt and send them out. You used a little short handled shovel. You had to have a light. They kept a safety rope on you. A couple of men could pull you out if something happened. If the walls, caved in, you might have a problem. It'd smother you to death. I've had it cave in up to my knees. I was lucky enough not to get hurt.

"We had a pole ladder going down in the well. It was just a long pole with boards. You could climb out of there if the water started coming in.



"Well diggers was afraid of joint clay. It's red clay that comes out in little pieces. It's dangerous. It'll cave in. They put boards on the walls of the well and braced between them with more boards. That held it.

"When you hit the first water, you put on rubber boots. You'd dig down and make a pocket to collect the water. They'd have a pump to take the water out.

"If the walls started to fall in, they had to wall it up with rock or brick. There was no concrete blocks then. I've lined wells with brick and rock.

"If the clay was good, you could just take strong cement mortar and plaster the walls. You put chicken wire around the wall and plaster it. The wire and cement together make it stronger.

"You can brick up a well. Down where you want the clear water to come in, you lay the bricks in a solid bed of mortar. Then you leave the joints between the bricks open. Don't put no mortar on the ends of the bricks, you see. That leaves one-fourth inch cracks between the bricks. The ground water comes in those cracks. You don't want the water to come in the upper part of the well. That's surface water. It may have dirt and germs in it. So you mortar those bricks in solid. Then you fill in behind

the bricks with mortar. That keeps the well water clean.

“Sometimes they lined the wells with clay tiles. They used big 30-inch tiles, the kind they used for drains. They’d lower them down on ropes. They fit into each other and made a good seal. They’d knock holes in the lower tiles to let the water in. That was cheaper than bricks. People back then didn’t have enough money for brick or a drilled well. People would swap work. You help me and I’ll help you. Things could get that way again.”



Finding Water – A Gift of God

People who dig or drill a well want to be sure they will find water. How do they know where to put the well? People used to ask a water witch to find the best place to dig. These are people who can find out where the water is under the ground. They use a stick or a wire to find it. People still witch for water in Tennessee. Even some well drillers witch before they dig.

Several people in the Sequatchie Valley can find water. Mae McDowell is one of them. She was still finding water for people when she was in her 70's.

Mae McDowell: "I use a straight stick. About a three foot long switch. One end has to be limber (bend easily). Really, I prefer a peach tree limb. A lot of the time I don't have that. So I just get a dogwood or whatever's handy. It works. Some people use a forked stick. But I don't.

"I hold to the little end of the stick. Then I walk real slow. When I get over water, the stick will go to bobbing up and down. It'll do that a while. Then it'll stop. You can hold it as tight as you want to. It just keeps beating till it stops. I don't know what makes it move. It just does. I think the water is the cause of it.



"I count the beats – the times the stick moves. The water will be that many feet deep. I've had people hit water just exactly that deep. Other times it don't work. If I was looking for a well for myself, I'd kinda go by it. But it doesn't work every time.

"A few years back they had a leak in the water line out here. They wanted to find out where it crossed the road. I just got a switch and went out and found it.

"I don't know any young people who know how to find water. If they would try, they might be able to. When I go out to try for water, the ones that are there will get a stick and see if it'll work for them. I never taught anyone.

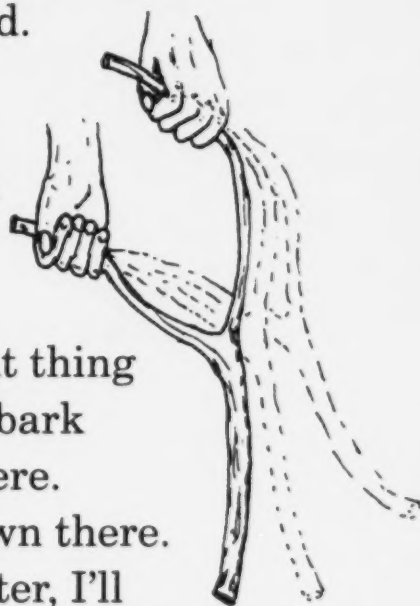
"I can't tell you much more about it cause I just don't know much."

Charlie Clark can also find water.

Charlie Clark: "I get me a forked dogwood switch. Take hold of the little end. Grip it good. Point it down. Go along where you are looking for water. Take real slow steps. If you are inclined to do things like that, it'll move. You can feel it. If you run across a stream of water, it'll just twist around.

"A boy down here wanted me to help him find where to drill his well. I walked around his house a time or two with a switch. I didn't feel anything much. Finally, I came back across the same place real slow. Do you know, that thing just twisted so hard in my hands, the bark came off. I made a cross mark right there. I said, 'Now you set your drill right down there. Go down 50 feet. If you don't strike water, I'll be badly fooled.' In 25 feet he found water. Plenty of it.

"Right over here a man had drilled so many wells. He still hadn't found water. I went over there with a dogwood switch. Well, when I first took a hold of it, it wouldn't move. I wasn't close enough to the stream. I made another trip across. That thing like to had a fit. Twisted and went right straight down. I walked across the place again. It did the same thing. I said, 'Listen, I'm making a mark. You drill down there about 40 feet.'



"They drilled that well. They hit water at 41 feet. And I said 40! Oh! I ain't so sharp, but I do like to help people."

Water witching is useful even if you don't need a well dug. Arley Laymon uses it to find where his water lines run.

Arley Laymon: "I can find our water pipe anywhere. I generally use pieces of wire. A peach tree limb is OK. When you cross over water, that stick will twist plumb around in your hand."

Elmer Marsh has seen water witching done many times.

Elmer Marsh: "I've never tried it myself. I don't know if I'm gifted with it or not. But I never had no confidence that I could do it. I used to not believe in it. But it's the God's truth. Some people are gifted with it. I've seen lots of people who wouldn't believe in it. They'd watch someone witching. They still wouldn't believe it. They'd say, 'Why, you're a twisting that stick!'

"In some cases that might have been true. But I've taken hold of that stick and felt it bend when someone else was holding it. Lots of the time it's accurate. Just certain people can do it. That stick will bend when you get over the water. I've finally got to where I believe it works."

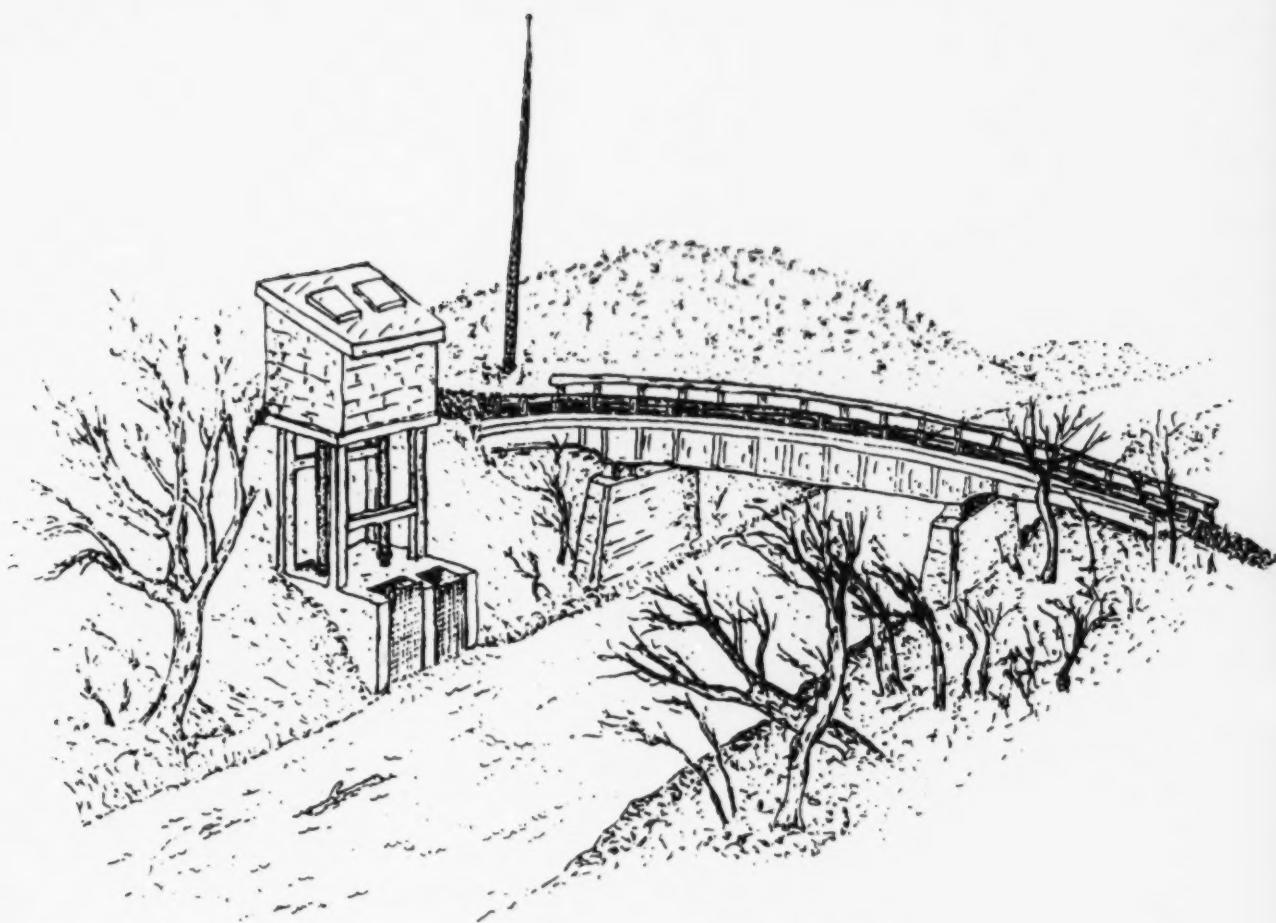
Clean Water For Towns

Towns and cities need large amounts of water. Every person who lives in a town uses about 70 gallons of water every day. Factories and businesses use water. Water is also needed for fighting fires and watering lawns and gardens.

Towns get their water from rivers, lakes, springs, or wells. The water supply has to be clean and safe to drink. It should not taste or smell bad. Most water must be treated before it can be used. A water treatment plant cleans the water and adds chemicals to kill germs. Then the water is pumped to people's houses.

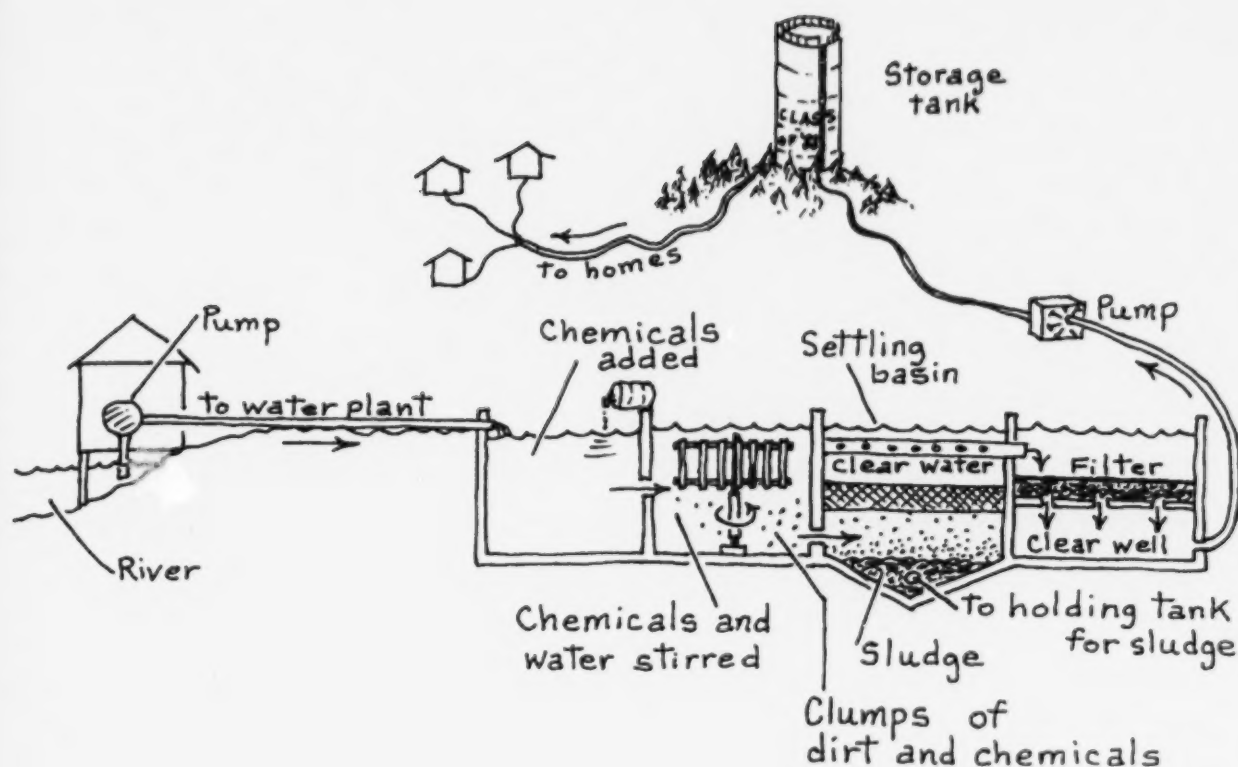
James Long is one of three licensed water plant operators in the town of Dunlap. Being a water plant operator is a lonely job. He is at the plant alone for most of his eight hour shift. But, as he says, "It's not a bad job. Nobody bothers you!" He takes his job very seriously. He is proud to say that Dunlap has pure, clean water.

Dunlap used to get its water from springs. When more people moved in, the springs didn't have enough water. So the city water now comes from the river. The raw, untreated water is pumped out of the Sequatchie River at a pumping station. The two



The pumping station

pumps can each pump 600 gallons a minute through an 8-inch pipe. The pipe carries the water to the water treatment plant in Dunlap. The plant treats about 500,000 gallons of water every day except Sunday.



The water is pumped into large open basins (tanks). They are about 20 feet deep. In the first basin, the water is treated to get rid of the mud and dirt. A chemical is added to make the solids in the water sink. The operators run tests on the water every day to see how much to add. If the water is very dirty, they use more chemicals. Alum is one of the chemicals. It gets sticky in the water. It traps the fine pieces of mud. It also traps germs. Then it sinks.

Chlorine is added to kill germs. Lime is added to keep the water from being too *acidic*. Beaters mix the chemicals into the raw water. In the next basin, large

paddles gently stir the water. The dirt, mud, germs, and chemicals are trapped together in clumps.

Next the water goes to the settling basins. There the large clumps settle to the bottom. There are plastic tubes in the basins. They look like honeycomb. These tubes keep the clumps trapped in the bottom. The clear water rises. The clumps of mud, germs, and chemicals in the bottom are called sludge. The sludge is drained out into a holding tank. Later the sludge is taken to a landfill. Tubes with holes in them take off the clear water at the top of the basins.

The water coming from the settling basins looks very clear. But it is not yet clean enough. Next it goes to the filters. The filters contain three sizes of gravel, three sizes of sand, and a layer of a special kind of hard coal. Three hundred gallons of water pass through each filter every minute. The filter takes out material too small to see. The coal helps clean the water. Water coming from the filters is very clean.

When the filters get dirty, less water can go through. Meters in the filter room tell the operator if the filters need washing. The filters are washed by pumping clean water back through them.

Some germs can go through the finest filters.

Chlorine is added again. There has to be enough chlorine in the water to kill all the germs that can cause diseases. By State law, the water must have at least one-half part per million chlorine in it. That is about 12 pounds of chlorine for 500,000 gallons of water. The chlorine gas is in tanks. It is under pressure. Pure chlorine gas is very poisonous. It is kept locked up.

Fluoride is another chemical that is added to the water. In very small amounts it helps stop tooth decay.

After the chlorine and fluoride are added, the water is tested again. It is tested for chlorine, fluoride, hardness, to see how *acidic* it is, and to check on how clear it is.

Below the rest of the plant are deep basins called clear wells. They hold the clean, pure water. The water is pumped from the clear wells to the town and to storage tanks.

When the water comes down from the tanks, it has good pressure. There has to be enough pressure to carry the water to every home on the water system. The pumps at the water plant use electricity to pump the water up to the tanks. But even when the power is off, water can flow from the tanks to the homes by gravity.

Special tests are run on the water every year. These tests check for insecticides, chemicals, metals, and other dangerous things that may be in the water.

James Long: "We check for everything. Our water has always been accepted. I'll tell you what, there's not enough people that are concerned with their drinking water. A lot of people just think the State takes care of it. If I move to another area with city water, I'm going to want to know what's going on.

"I live on the mountain. I have a well and an electric pump. We use a filter on the water to get the iron out. It keeps most of it out. Over a long period of time, T-shirts get a reddish color. If you don't have a filter, that iron water will turn the sinks and basins red.

"When I was growing up on the mountain, I never thought much about it, what we did for water. We used to carry it from a spring. At least you had water when the power was off! During the storm that broke all the trees down last winter, we were out of power at our house for two days. And when you've got an electric pump in your well, you're out of luck. Of course, we have gravity water here in town from the tanks even when the power is off. As long as the tanks are full.

"Working as a water plant operator is a good job. It's worthwhile and fulfilling. But to get a job a person might have to move around. We're lucky here in Dunlap to have two full-time licensed operators. We're only required to have one.

"To get a license, first you have to work with a licensed operator for a year. Then you go to school for two weeks, and take the State test. After you get licensed, you have to take a short course every three years.

"It's a challenging job. And with more *pollution*, *acid rain*, radioactive waste, and stronger rules for clean water, it's going to get more challenging."

Information, Please

chlorine – a greenish poisonous gas

- In small amounts, **chlorine** can kill the germs in drinking water. People use chlorine bleach (Clorox or Purex) for making clothes white. Poison gas made from chlorine was used in World War I. It made people very sick and hurt their lungs. It is now against the law to use poisonous gas in wars.

fluoride – a kind of *fluorine* that is added to drinking water

- **Fluoride** is added to drinking water in many towns. Scientists have found that a very small amount of fluoride in the drinking water makes teeth stronger and helps prevent tooth decay (rotting).

fluorine – a poisonous gas used to make many important chemicals

- *Acid* made with **fluorine** can dissolve and eat into glass. It is used to make (etch) pictures on glass. The non-stick coating on pans is made from fluorine. A chemical called CFC is made from fluorine, chlorine, and carbon (coal is a form of carbon). CFCs are used to make Freon, the gas used to cool refrigerators and air conditioners. CFCs are also used in industry as cleaners and to make plastic foams. CFCs are not poisonous, but they cause two serious problems. They add to the problem of *global warming* and they cause damage to the *ozone layer*.

global warming – an increase in average temperatures on Earth

- **Global warming** can be caused by increases in some gases in the air such as carbon dioxide and CFCs. Carbon dioxide is produced by burning wood, coal, gasoline and other fuels, and by forest fires. CFCs are made by industries and are constantly leaking into the air. Global warming can change climates everywhere and can cause the ocean levels to rise. This may cause flooding in places near the oceans. Many scientists think global warming is beginning to happen now.

ozone layer – a layer of ozone gas about 12 miles above the ground

- The **ozone layer** protects life on Earth from the dangerous rays of the sun, such as UV (ultraviolet) rays. CFCs and other gases are now damaging the ozone layer. This means more UV rays can get to the ground. This may cause skin cancer in people and other problems for all animals and plants. Probably nothing could live on Earth if the ozone layer were completely destroyed. Scientists are trying to make safe new chemicals which can take the place of CFCs.

acidic – containing acid

- An acid is a chemical that has a sour taste. Vinegar is an acid. Coke and other sodas are **acidic**. Rain water is slightly acidic. Strong acids can burn the skin. Even weak acids can eat away rock and hurt plants.

acid rain – rain that is acidic because of air *pollution* from factories, cars, and power plants that burn coal

- Sulfur and other chemicals go into the air when coal is burned. The rain picks up these chemicals. They make the rain acidic. It is so acidic it can cause trees to stop growing or even die. It makes some lakes so acidic that the fish die.

pollute – to make the soil, air, or water dirty from waste

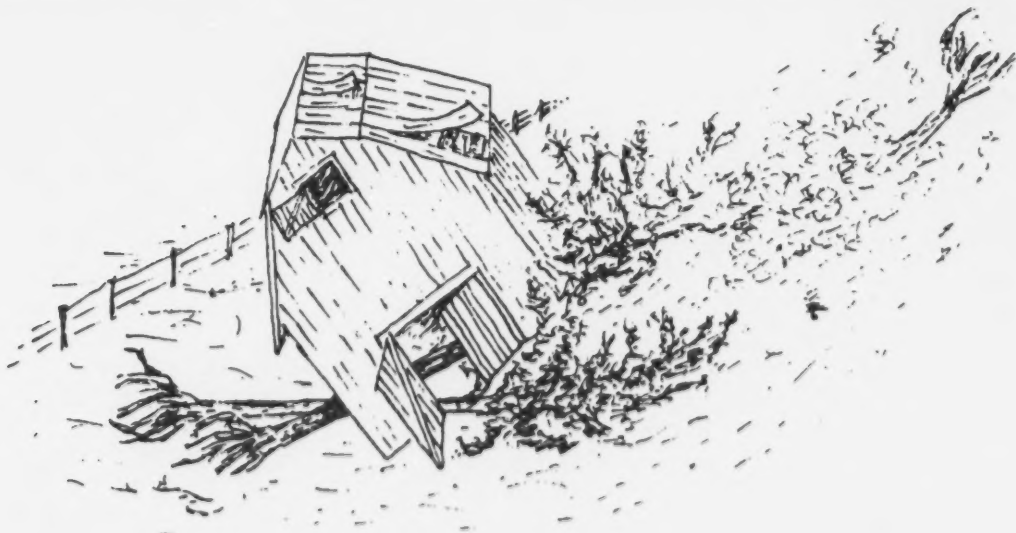
- Sometimes factories dump their wastes into rivers. Some people run their sewage straight into rivers. Then the rivers get **polluted**. They may look and smell dirty. The fish may not be fit to eat. They may die. A few years ago, one river was so polluted that it caught on fire!

Smoke can pollute the air, too. Factories and electric power plants that burn soft coal sometimes cause very bad air pollution. Today, most smoke from these plants is cleaned before it goes into the air. Cars don't pollute as much now because they have pollution controls on them.

“Think It’ll Rain?”

Plenty of water comes from the sky on Tennessee. It rains about five feet (60 inches) every year in East Tennessee. That’s a lot of water. Sometimes it rains too much at one time.

In 1928, there was a bad flood in Dunlap. It rained so hard that the streets were four feet deep in water. Railroad tracks were washed away. Some rails were broken in half! Mine equipment was washed away. A new barn was washed down the mountain. Six cows



drowned. Houses were deep in water. One man had to stand on his bed and call for help.

In 1982, it rained 11 inches in less than five hours on Walden’s Ridge. Mud and rock slides washed away homes and roads. Bridges washed away. Roads

slid down the mountain side. Cars were buried under rocks and mud. Railroad tracks were washed away in this flood, also.

Sometimes it rains when it should snow. If it's below freezing, the rain turns to ice when it hits. Ice covers trees, telephone lines, roads, and cars. In 1985, an ice storm hit the Sequatchie area.



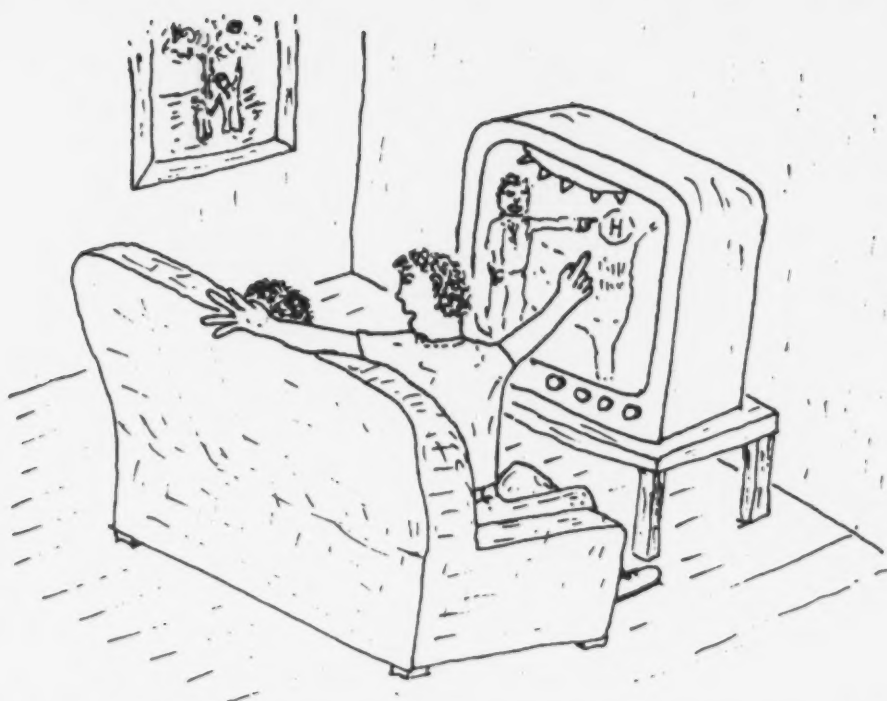
So much ice was on the trees that they broke down. The trees were cracking and breaking for days. People said that the noise of the trees sounded like a war. Many homes and some towns had no electricity for a week or more. School was out in several counties because the buses couldn't run.

No one ever knows what the weather will do next in this valley. It's 80° in January. It snows in April. The first frost may come in early October or the middle of December. One winter the low is 15° above. The next it's 20° below. One summer it rains so long the corn rots in the ground. The next summer it

doesn't rain. The corn dries up. That's Sequatchie Valley weather. The valley is between the colder North and the warmer South. The weather can be different every year. It's hard on the farmers. But there's always something to talk about!

People have always tried to forecast the weather. The old timers had their own ways. If the hornets' nests were near the ground, the winter would be cold. The number of fogs in August told the number of snows that winter. Thick shucks on the corn and black wooly-worms meant a cold winter. If the leaves hang on the trees late into the winter, it'll be cold. The squirrels will use the leaves to make their nests warmer. A ring around the moon meant rain. One star inside the ring meant rain in one day. Three stars meant rain in two or three days.





The modern farmers don't go by the old signs. They watch the weather report on TV. Instead of, "Smoke's lying low, bad weather's coming," they say, "The weather man says the leading edge of an arctic front is going to be here tomorrow afternoon with a few snow flurries." Meteorologists (people who study the weather) use satellite pictures and the most modern scientific methods.

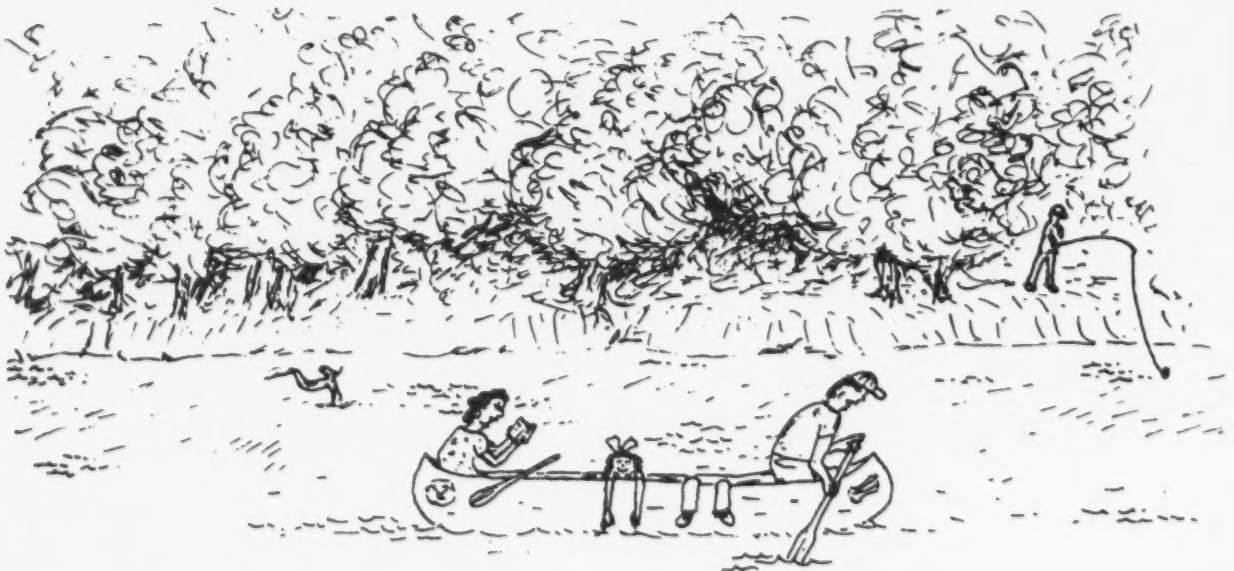
But they can be wrong. Some farmers figure they can't depend on weather reports. They still watch the signs. "Well, there's a ring round the moon tonight. Reckon it'll rain tomorrow, no matter what the TV says! Better get in the hay."

Yep. You can always talk about the weather. But you can't do much about it.

Floating Down the River

The shining water that moves in the streams and rivers is not
just water but the blood of our ancestors.
The water's murmur is the voice of my father's father.
The rivers are our brothers, they quench our thirst.
The rivers carry our canoes, and feed our children.
You must give the rivers the kindness you would give any brother.
Chief Seattle, 1854

A canoe puts you as close to nature as you can get.
It's easy and fun to float down the Sequatchie
River on a canoe or raft. You will see the river and
the valley like the Indians did. Maybe you, too, will
hear the voice of Indians in the sounds of the
water.



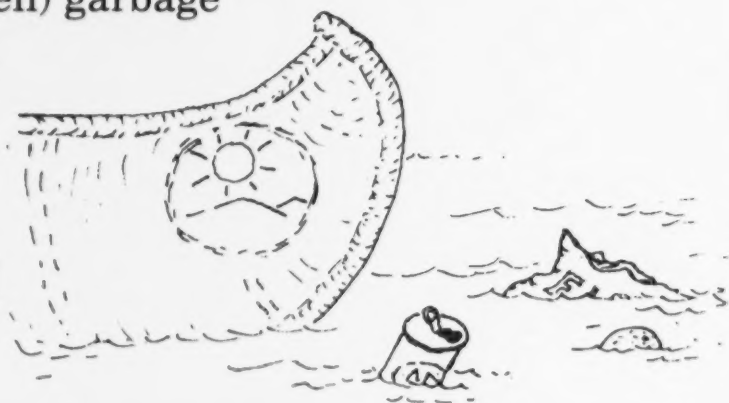
The river runs down the valley from Grassy Cove to Jasper. It joins the Tennessee River near Jasper. It is a quiet winding river. The river is about two to six feet deep. You don't have to paddle much. You can float most of the way. Even people who have never been in a canoe before can do it. It's fun for the whole family.

Along the way you will see the most beautiful scenery in Tennessee. You can see the bluffs along both sides of the valley. In the fall, the woods are full of color. In the spring, dogwoods and redbuds bloom like clouds on the mountain sides.

You can fish for redeye, bass, and cat as you float along. You may see deer, beaver, raccoons, and water birds.

In some places the river will not be so beautiful. You may see (and smell) garbage and dead animals. It was not always like this. The Indians loved our rivers. A TV ad once showed an Indian in a canoe on a beautiful river.

He looks into the clear water and sees a can and a plastic bag float by. He pulls the canoe up on the



bank. Then he walks through cans and garbage. He stands alone. A tear rolls down his face.

The people of Tennessee love their rivers. They try to keep them clean and beautiful. It's good business, too. Tourists come to Tennessee because of the rivers. They rent canoes and rafts. Both tourists and local people like to float the rivers.

One sunny Saturday, grab the kids, some sandwiches, Cokes, and a fishing pole. Rent a canoe and float down the river. Listen for the voices of Indians in the water. Watch for wild animals along the banks. Take a nap in the sun. Have a beautiful day. Remember to treat the river with kindness. Leave it more beautiful than you found it.

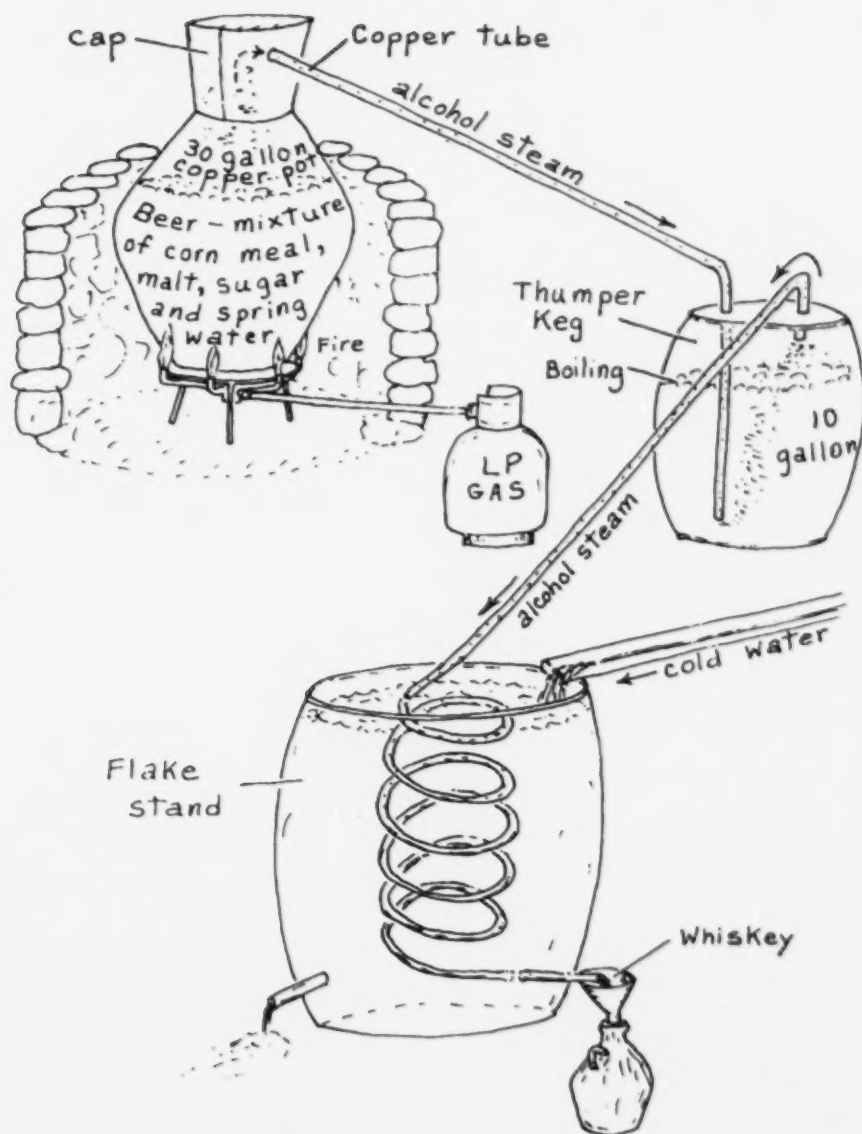
Water and Corn

Some of the early settlers didn't need much water to take baths. They figured that one bath a year was plenty. They didn't wash their clothes very often. They weren't very excited about drinking the water, either. So they found a better use for it.

They added the good mountain water to corn they grew themselves. Put in some sugar. Heated it over a fire made of ash wood. Cooled it in a mountain stream. Then it was fit to drink! They called it mountain dew, white lightnin', moonshine, or just corn whiskey. It helped to warm a man's soul, cure his kids' colds, and pay the bills.

Arley Laymon: "I never had but one still. Me and my brother Charlie had one. We just put it up as a kind of a play outfit when we was boys. When we'd get ready for something to drink, we'd just go run us a barrel of our own. So we could drink good whiskey. The real stuff. But the law tore it up.

"You make a still out of copper. First you have a big pot. It's small at the bottom and large at the top. The pot goes into a furnace. You build the furnace out of rock. The fire has to go plumb around the pot and out the back. We had one of these LP tanks of gas. Had a blower that went around the firebox.



Blew the fire around each side of the pot. We didn't go out and cut wood. The gas ran faster than wood. And there weren't no smoke for the law to see.

"Then you have to make a cap to fit down on the pot. A pipe runs from that over to the ten gallon thumper keg. It runs the steam from the pot plumb to the bottom of the thumper keg. The pipe has slits

in it so the steam can get out the bottom. The whiskey boils in the thumper, too. That means you double boil it. That's what makes your whiskey. If you don't, you just get what's called singlings. It's weak.

"Then the steam comes out of the thumper through another pipe and goes over to the worm. The worm goes down through the flake stand. You run cold water through the flake stand and around the worm to cool the whiskey. You have to be near a stream or spring to get the water.

"The end of the worm went into a big funnel and into the jug. Kept a flannel rag in the bottom of that funnel. Put clean hickory charcoal in the rag. It'd get all the bardy grease out of it. That's the stuff that forms in with the whiskey. It's poison. But the rag and charcoal takes every bit of it out. You can drink it right then.

"To make the mash, you first have to get you a bushel of corn meal. Heat a pot of scalding water. You put the meal in a 60 gallon barrel. Then you pour that hot water in on it. You have to stir it good. You let it sit there about three days till it gets baked good. Then you take a long wooden paddle and stir it up good with water. All that baked meal dissolves.

"Then you have to add your malt. We always made the malt with white corn. You dig a hole in the ground. Put the corn in it and keep hot water poured over it. In two or three days, it'll have great long sprouts on it. If you have a grinder, you can grind it wet. If you take it to the mill, you've got to dry it first. We used to take it to the mill in Dunlap. But they went out of business. So we'd have to take it plumb down to Ketner's Mill. Sometimes we'd sprout rye instead of corn. That'd make rye whiskey. But we'd always rather have corn.

"You put about a peck of that ground-up malt in with the stirred-up meal. You put the sugar in. Takes about 20 pounds to make three gallons of whiskey. Filled the barrel up with water. That'd sour and go to working. It'd just roll. When it got to working, it'd form a thick cap on top. It'd set there and work for five or six days. Then that cap'd go to breaking up and go to the bottom. When it done that, it was ready to run.

"If you just had a 30 gallon pot, you'd have to run it twice. It'd take about two or three hours to run it.

"The whiskey we used to make would have great big beads (bubbles) in it. As big as the end of your finger. It's weak if it won't bead. Good whiskey has beads as big as marbles. If it don't bead, it'll give

you the headache. We'd run our alcohol then run the backings. Backings is when the whiskey won't bead. It's weak. You cut the whiskey with the backings to get whatever proof you want. We'd run ours about 90 proof. Backings is better than cutting it with water cause it's stronger.

"We'd throw some of the whiskey in the fire. If it wouldn't burn we wouldn't drink it. It had to be pretty good stuff to burn. You can take that alcohol like we run, and put it in a car. It'll go right on. Stuff you buy at the stores – drink a half pint of that and you'll have a headache for a week. It's too weak. Too many backings.

"You couldn't keep people from knowing where a still was. Somebody'd find it. You might keep it hid a while. First thing you knew, somebody'd run on it.

"I never did get caught. Charlie did. We had seven barrels ready to run when the revenuers got him. I'd went to Dunlap. They got him while I was gone. I got back down to the beer joint here. They told me, 'They done took Charlie to Chattanooga.'

"Of course, if I'd been there, they wouldn't have got me. I was always looking. I could spot anybody 300 yards away. I'd see them move. But Charlie never would look. That's how come him to get caught. They

just walked right up and took hold of him. Him just standing there. They blowed it all up. Threwed the dynamite to it.

"I used to be a deputy. Half the time we wouldn't catch nobody. They'd keep watchmen out along the roads. But I've blowed stills up out on that other mountain. Old black pots that made that old mean stuff. They wouldn't cook no meal to make it. They'd just pour a sack full of sweet horse feed in a barrel instead of meal. That was the awfulest smelling stuff. They'd put up a barrel of that and throw about a half bushel of barley malt in. It'd work off in three days.

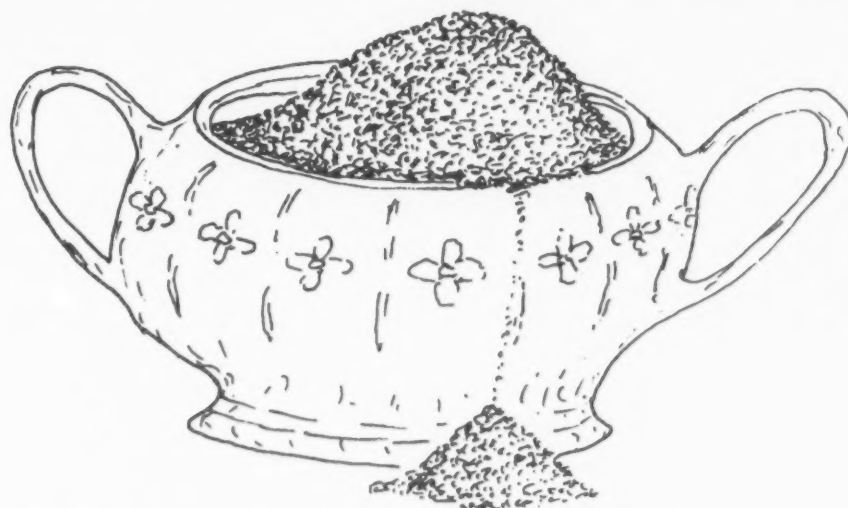
"They'd make their pots out of tin. Sometimes they'd just work their stuff off in the pot. Those black pots would hold about 500 gallons. They'd put about 500 to 1000 pounds of sugar in and run off about 100 gallons of whiskey. That was a nasty way of doing it. They'd pour carbide in it to make it boil. They'd even put ivy root in to make it bead. It's poison. If whiskey won't bead by itself, it ain't no count. We used to blow up black pots with a half bushel of ivy roots in them. Used to you could buy it for 50 cents a gallon. But what it was!

"We learned something else blowing up those big pots. If you just throw the dynamite in, it'll blow the

bottom out of the pot. If you get you about a half bucket of beer and put your dynamite in that, and float it on top, buddy, them things will go a hundred feet high! You have to get away or that junk will fall on you. Old nasty stuff. It'll kill you. We blew up a many of them.

"It's a funny thing, making whiskey."

D. Wooden: "There used to be a lot of moonshine made when I was growing up. We'd be out in the woods looking for the cows. We'd find big piles of sugar covered with canvas. We'd eat it. They'd tell

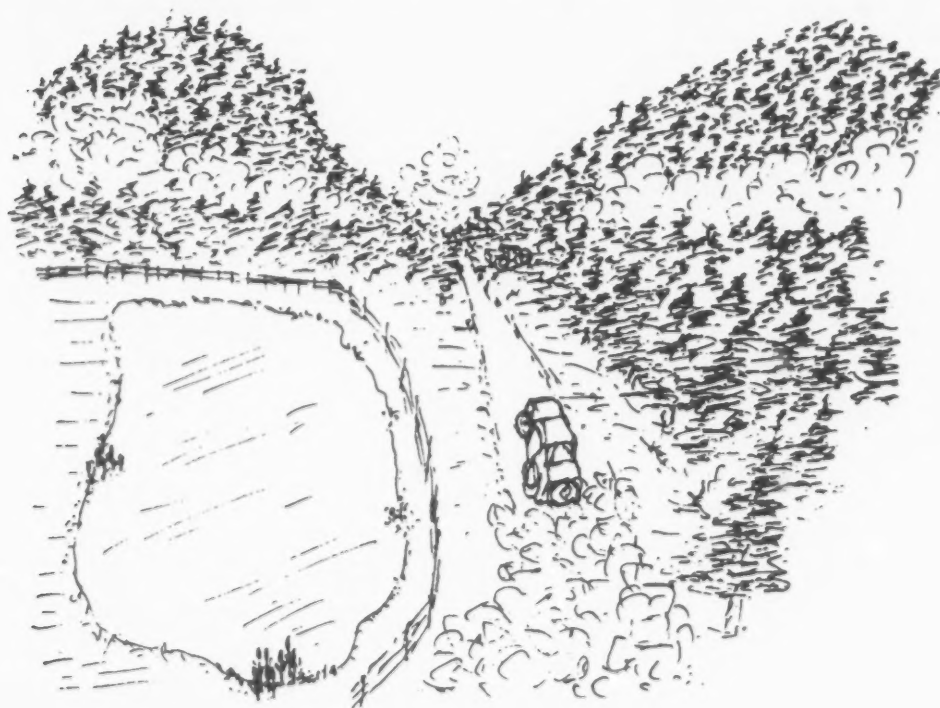


us, 'Now you watch 'bout your mammy's sugar bowl. Don't let it run out. Don't waste the sugar, but take what you want.' They knowed that we knowed they was fooling with whiskey.

"The government finally got to limiting the sale of sugar. You first had to sign your name and address

to buy sugar. Old Hershel, the man that owned the store, like to got into trouble over that. He was selling too much sugar and couldn't give account of where it went. He'd sell them a two-ton truck load if they wanted it. He'd say, 'I've got a license right up there on the wall to run this business. I buy everything I've got in here to sell at a profit. That's what I'm in business for. It's none of my business what anybody does with anything I sell.'

"I've seen 14 stills on one creek, all in operation. We was down looking for cows one time and crossed the bridge over that creek. Here come Bud, tearing along in his pickup truck. I reckon he was



the watchman. He drove up on top of a little hill, stopped, and jumped out. He set off a big bunch of dynamite. He was warning them that the revenuers was coming. It wasn't long before there was quite a bit of traffic on that road! And there wasn't all that many cars in the country then! All you could see of them cars was a big ball of dust. They could really handle them old cars.

"Them people that was making whiskey, they wouldn't bother you. They'd help you any way they could. But you better leave them alone. I'd rather see a man making whiskey for a living than stealing. Cause he's working for a living. All he's doing is chiseling the government out of the taxes. You can buy bonded whiskey anywhere. It's just illegal to make it on account of the revenue tax.

"A body's scared all the time they're fooling with it. But they ain't stealing nothing. I'll tell you there's been a few times when there wasn't much else to make a living out of. You had to do something. Back in WPA days (during the Depression) there wasn't any work to do. When you found a job, you couldn't get no money out of it. I can remember when I worked for fifty cents a day. That was sunup to sunset. But a man could always make money out of whiskey."

Information, Please

Making Moonshine

- It's not easy to make **moonshine** whiskey. First, corn meal, malt, sugar, and water are mixed together and kept warm. After a few days, the sugar turns into alcohol. This mixture is called beer. It has a small amount of alcohol in it, about like regular beer.

The mixture is put into a copper pot and boiled. The alcohol evaporates (turns to steam) before the water does. The alcohol steam goes up through the cap and into a copper pipe. The copper pipe goes through a barrel of cold water. There, the alcohol steam cools and turns back into liquid. This is the whiskey. The first whiskey that comes through is almost pure alcohol. It's too strong to drink.

When most of the alcohol is boiled off the beer mixture, the stuff that comes out is weaker. It's called backings. They add this to the stronger whiskey to get the right strength, or proof. They can tell how strong it is by the size of the bubbles in it. That's called the bead.

PART THREE

Power and People

Water for Power

Back of the loaf is the snowy flour
And back of the flour is the meal
And back of the meal is the sun and shower
And love and the Father's will.

M. D. Babcock

The early settlers who came to farm the mountains and valleys of Tennessee were hard workers and very smart people. They didn't have many sources of *energy*. They didn't have electricity or gasoline engines. The main source of energy was their own bodies. They worked long and hard. Horses and mules were another source of energy. They helped with plowing and with carrying things. Trees provided energy for heating homes and cooking food.

Some work, like grinding grain and sawing lumber, was very hard to do by hand. People began to look for easier ways to get work done. Tennessee's rushing waters gave them the answer. By the early 1800's, people had begun to use the energy of running water. Soon, water mills were built along many streams and rivers. The energy from the water was used to grind grain, saw wood, make finished boards for homes, gin cotton (take seeds out of it), and card wool (clean and straighten the wool from sheep).



The mills made life easier for everyone. Soon they became important meeting places. People would bring their grain or wood to the mill. They would stay to “set and talk awhile.” Homes were too far apart for visiting much. But there were two places everyone went – the church house and the mill.

Charlie Clark remembers the mill by his house. “It was set up where the branch runs into the Sequatchie River. There were flood gates across the branch to back the water up. When you’d go to grind corn, you’d open up that gate and let the

water go on down to the wheel. It ran a sawmill, a cotton gin, and a grist mill (for grinding corn).

Children were sent to the mill with a bag of corn or wheat. Thaxton Kell remembers. "My dad used to set me up on a mule and set a bag of corn behind me. That bag would shift and fall off. I'd have the awfulest time getting it back on! When I'd get home with the meal, the bag would be all dirty and sweaty! But that meal sure tasted good."



Children played games about mills. Charlie Clark remembers *The Dusty Miller*. "It was a kind of game, or dance. The boys and girls would make two circles. They danced around to these words:



Dusty is the miller who tends the mill
The mill goes around, with a free good will
The miller's hand upon the hopper
And his foot upon the sack
Every time the mill turns
The boys turn back."



KETNER'S MILL

Ketner's Mill is a well-known historical place in the Sequatchie Valley. It has been used for grinding corn and wheat since 1824.

Clyde Ketner has been working at the mill since he was 12 years old. He began running it in 1930. He is still producing cracked corn and wheat for chicken feed and water-ground white corn meal. His corn meal makes the best corn bread around. He also grinds whole wheat into flour for making bread and biscuits.

Clyde Ketner: "My great-grandfather began running this mill before 1850. The old wooden building over the river was the first millhouse. It was built in 1824. They started building the brick mill just before the Civil War. They didn't get it finished till 1872. That was because of the war. There used to be 12 turbine wheel mills on the Sequatchie River. They're all gone now but this one.

"During the Civil War the miller had to grind meal for both the armies. At the first of the war, the Confederate soldiers brought grain to the mill. They'd go around to any farmers that had corn. They'd just take it. Then they'd bring it to the miller. Of course the soldiers would have to shuck and shell it first. The miller would have to grind it whether he wanted to or not. They'd usually pay the miller with scrip. Scrip was just a piece of paper promising to pay later. They'd say that when the war was over, they'd change the scrip for money. But you could have a basketful of the scrip or Confederate money either and it wasn't worth anything. The last year of the war the Union army did exactly the same thing. They took the farmers' corn and brought it the mill to be ground. They didn't redeem their scrip either.



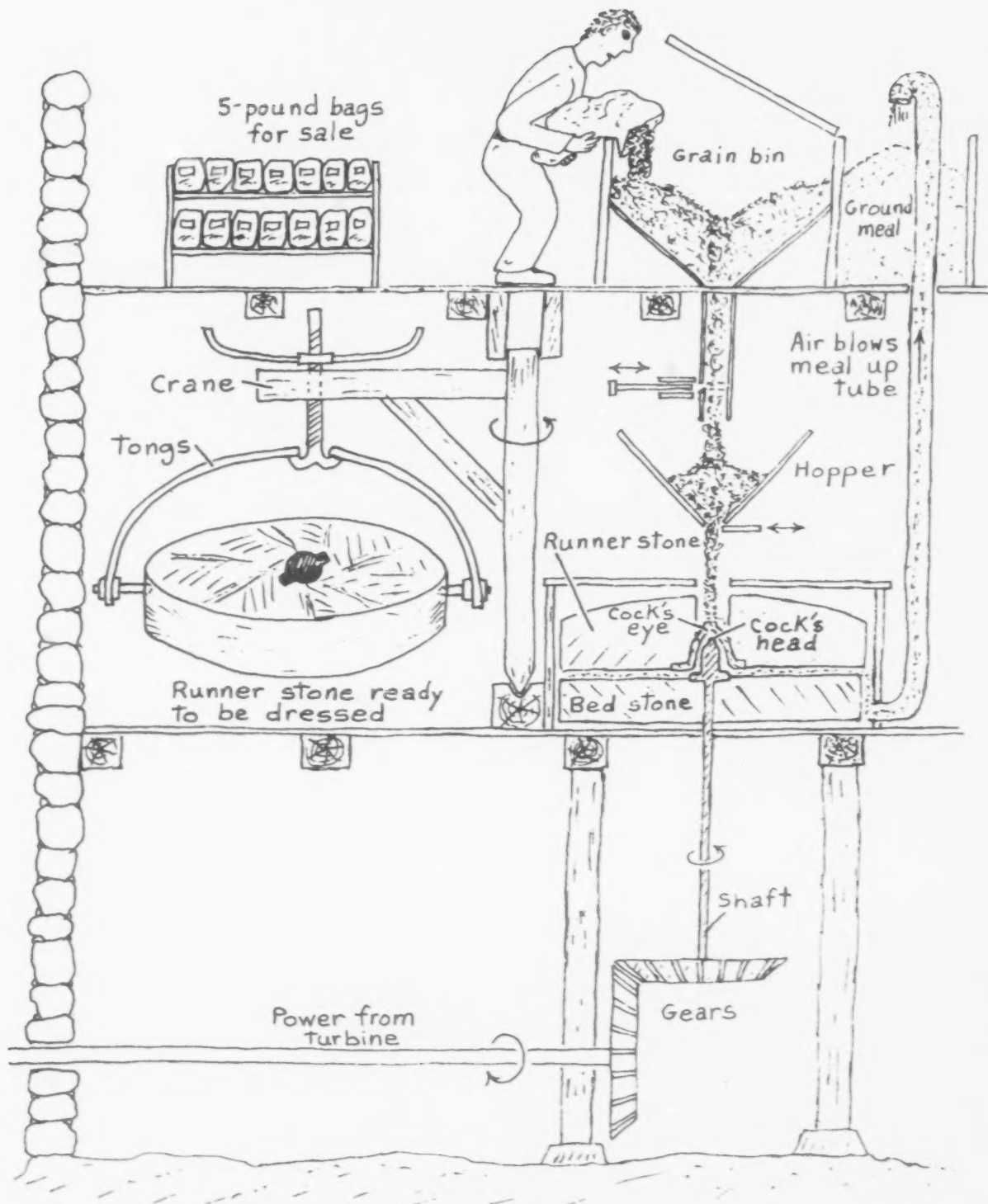
"Nothing that runs in this mill is electric. It's all water power except for the lights. Always has been. When it was first built, up till about 1910, they just had the millstones for grinding. They made nothing but whole-wheat flour, rye flour, and corn meal.

There was no such thing then as the white flour we have today. We still make whole-wheat flour just like they did 200 years ago on these millstones with water power. There's not much market for it. But more people buy it now than 15 years ago. Doctors and everybody else are beginning to realize that whole-wheat is much healthier than white flour. It has more food value. People are going back to it.

"We grind white corn meal on the millstones, too. We sell our water-ground corn meal to grocery stores. Most of the corn meal is bolted. That means we sift out the rough parts and the larger pieces. The stuff we sift out goes into animal feed. Some people buy the coarse stuff to cook as grits."

The millstones are the true heart of the mill. The river turns the water wheel. The water wheel turns *gears*. The gears turn the millstones. The two millstones do the grinding. The upper stone is balanced above the lower stone. The cleaned grain (wheat, rye, or corn) comes down from the upper floor of the mill. It flows down to the hopper, a box just above the millstones.

The grain comes out of the hopper and falls into the opening in the center of the upper stone. The miller controls the amount of grain which flows from the hopper to the stones. The grain then passes



between the two stones. The upper stone can turn as fast as 140 rpm's (turns a minute). Most stones average 60 to 100 rpm's. The grain is cut by the moving stones. The ground meal moves to the outside of the stone. It is then blown by air up a tube to the upper floor. There it is bolted. It is next mixed with baking powder and salt. It is weighed and put into five-pound bags for sale.

Clyde: "When the mill was first built, most millstones were brought from Europe. The finest stones were from the Rhine River Valley. Most of the early stones were from France. The ones from England weren't as good. Later on, experienced millers who had come over from Europe learned that they could find stones here that were just as good. The stones in this mill came off Raccoon Mountain near Chattanooga. The rock is open and rough. It has a lot of little quartz pebbles in it. It's the hard quartz that makes it a good millstone.

"If you run the stones without grain between them for even one minute, the stones will touch each other. That wears the stones as much as two months of grinding. Those stones never touch if they are properly balanced and if grain is between them.

"The upper stone weighs about 3000 pounds. The lower stone weighs 1500 pounds. I take them apart

every six to eight months and dress them. That means we cut grooves in the stone. We cut the grooves with a bill. That's a double-edged chisel. The chisel has to be very well tempered to cut the rock. Most blacksmiths today don't know how to *temper* metal. It's a lost art.

"It takes a long time to cut the stone right. I hire people to do it. I have to teach them how. Three people can do it in a week. In the old days, the big mills would have crews just to dress the stones.

"After we dress the stones, we put them back in place. The upper stone has to be exactly balanced on the shaft. The shaft comes up through the center of



Dressing a millstone with a bill

the lower stone from the gears. The top of the shaft is not much bigger than the end of a pencil. It is called the cock's head. It fits in a small hole in a thick iron bar set in the center of the upper stone. The hole is called the cock's eye. If the upper stone is not balanced exactly on the cock's head, the stones will wear down in two weeks. They used to cut away part of the stone to make it balance. If they cut away too much, it messed up the stone. They would also pour lead in a hole in the stone to balance it. Some knuckleheads used as much as 40 pounds of lead. They didn't know what they were doing. Those stones turn as fast as 140 rpm's. You better have them balanced. If the stones aren't balanced, the whole damn millhouse will shake.

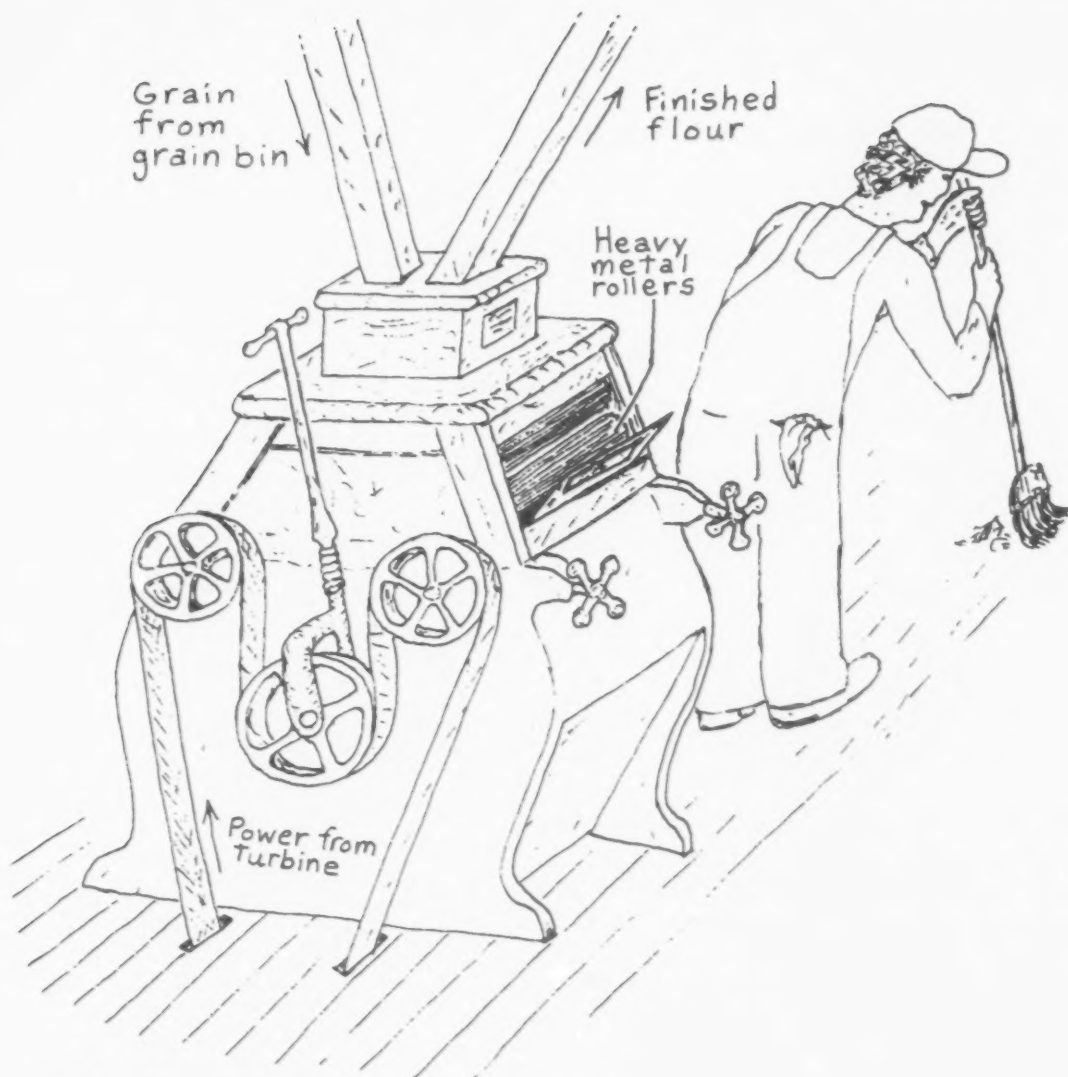
"Here's the way I balance the stones. You'll never find this method in any books. I figured it out myself. First, I put the bottom stone in place. I fill the cock's eye in the upper stone with melted lead. Then I set the upper stone on top of the lower stone. I can lift the upper stone a small amount with a screw. If the upper stone doesn't balance on the cock's head, I lift the stone and move it sideways a tiny bit. Then I lower it and try again. I keep doing this until the upper stone balances perfectly on the cock's head. I have then found the true *center of gravity* of the stone. Next I hit the upper stone with a sledge hammer. That leaves a

mark in the lead. I raise the upper stone and turn it over. I hang a *plumb bob* down from the ceiling directly over the mark. I flip out the lead. I move the cock's eye until it is under the plumb bob. Finally, I put back the upper stone. If it doesn't balance perfectly, I do it all again. All this may take two days of work."

The millstones take up only a part of the millhouse. A large, heavy metal roller mill does much of the grinding.

Clyde: "Now this roller mill is a modern machine. It was installed in 1910. The company that made the roller mill was in Knoxville. The roller mill is run by belts and gears from the water turbine just like the millstones. But the grain is ground by heavy metal rollers. It's much faster than the millstones.

"The first rollers just crack the grain. The finest parts are sifted out. Then it is ground again and sifted again. This is done on four different sets of rollers. Finally it comes out fine enough. This used to be a flour mill for grinding white flour. First the wheat was cracked, then sifted, then ground again. The bran and larger pieces were sifted out. They made flour so fine it was sifted through a Japanese silk cloth. You'd think nothing could go through that



cloth. But it did.

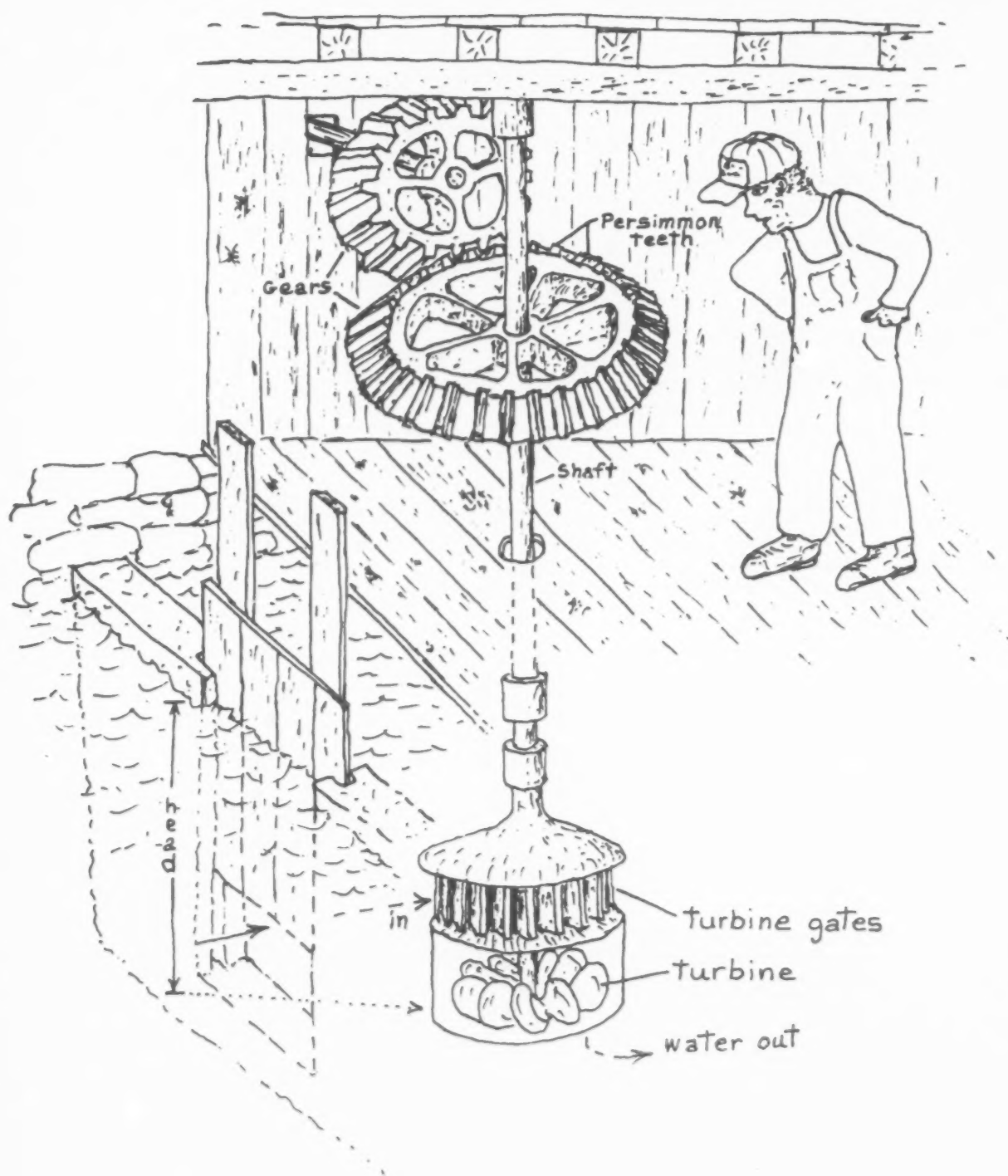
“Now we use the roller mill mostly for grinding scratch grain for chicken feed (made of cracked corn and wheat). We use a wire mesh cloth instead of the silk because we don’t grind it so fine.”

The source of the energy for the mill is the Sequatchie River. A low dam stretches across the river. It backs up the water and moves it to the

water wheel. Visitors are surprised that they can't see the water wheel. It is about seven feet under the water below the platform. It is not really a water wheel. It is a reaction turbine. The old-fashioned wooden water wheels look very pretty. But they can't produce as much energy as a turbine.

The reaction turbine works like a rotating lawn sprinkler. It is turned by the pressure of the moving water. The turbine is made of a shaft with curved blades surrounded by a metal case. Openings, called gates, in the case cause the water to hit and turn the blades in the right direction. The blades turn very quickly. Then the water flows out through the bottom of the turbine and back into the river below the dam. The turbine is about six feet across and four feet high. It is made of cast iron and weighs about six tons. The reaction turbine can get more than 90 percent of the energy of the moving water.

The turning shaft of the turbine is connected to gears and belts which carry the energy from the shaft into the mill to operate the machinery. The large gears have teeth made of persimmon wood. It does not change shape when it gets wet. It is also a very strong wood. Some of the same teeth have been in use since 1948.



The turbine must be under the water. The depth of the water from above the dam to the turbine wheel is called the head. When the turbine is under seven feet of water, it can produce 38 *horsepower*. When the head is nine feet, it produces 60 horsepower.

In order to get enough head all year round, they had to build a dam. The first two dams were built of wood. When the wood dam was partly washed away by heavy rains in 1973, Clyde built a new concrete dam.

Clyde: "I worked on that dam from 1974 to 1976. It's concrete. Contractors wanted \$80,000. So I built it myself. Got to have 15 permits to build a dam, but I own the land on both sides of the river, so there was no problem."

Farmers in the Sequatchie Valley bring their corn and wheat to the mill. With the help of the river and the miller, the corn and wheat become flour, corn meal, and animal feed.

Nothing tastes as good as bread made with freshly water-ground corn meal and whole-wheat flour.

This recipe is from Ketner's Mill.

Mexican Corn Bread

- 1 1/2 cups KETNER'S Self-Rising Corn Meal
- 1 egg
- 1/4 cup chopped bell pepper
- 1/4 cup cooking oil
- 1 8-oz. cup sour cream
- 1 cup cream style corn
- 2-3 small jalapeno peppers (chopped fine)
- 1 cup grated cheese

Preheat oven to 450°. Grease a large iron skillet, sprinkle with corn meal, and heat. Mix all ingredients except cheese. Pour half of the mixture in the skillet. Spread the grated cheese over this. Pour the rest over the cheese. Sprinkle the top with corn meal. Bake about 45 minutes, or until done in the center. Makes 10 to 12 servings. (Tastes even better the second day, or you may freeze it.)

Ines and Johnnie Tucker like this recipe.

Corn Bread

- 1 1/2 cups sifted plain (not self-rising) stoneground corn meal made from Hickory King white corn.
- 1/2 teaspoon baking soda
- 1 teaspoon salt
- 2 teaspoons baking powder
- 1 egg
- 2 tablespoons mayonnaise
- 1-2 cups buttermilk, water

Heat oven to 450°. Grease nine-inch iron skillet. Sprinkle with cornmeal. Heat skillet. Sift dry ingredients together. Make a well in the dry ingredients. Break egg into the well. Add mayonnaise. Add enough buttermilk to make a batter. Stir. Add water to make batter thin enough to pour. Pour into hot skillet. Cook until brown. This is better if cooked in a wood-burning cookstove.

Every October there is a crafts fair at Ketner's Mill. People from all over Tennessee come to see and buy the work of the craftsmen and artists. A mule turns a sorghum mill to make molasses. A blacksmith makes horseshoes. Weavers are at their looms. A broommaker ties bundles of broom corn together. A moonshine still makes whiskey. Local musicians play bluegrass music. And, of course, the mill is grinding meal, just as it has for 160 years.

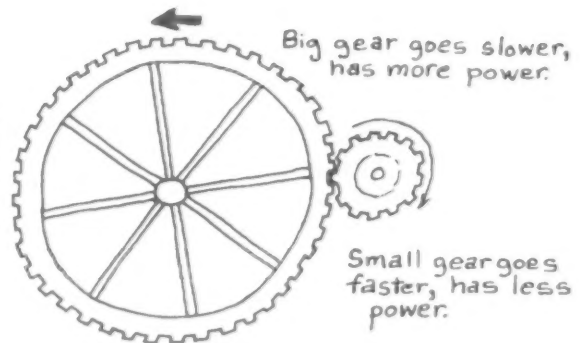
Information, Please

energy – the power to do work

- **Energy** is the power to lift or move something. Burning gas makes the energy to move a car. Light, heat, and electricity are all different kinds of energy. Atomic energy comes from splitting atoms.

gears – wheels with teeth that fit into teeth in another wheel

- If the wheels are of different sizes they will turn at different speeds.



temper – to make a metal hard

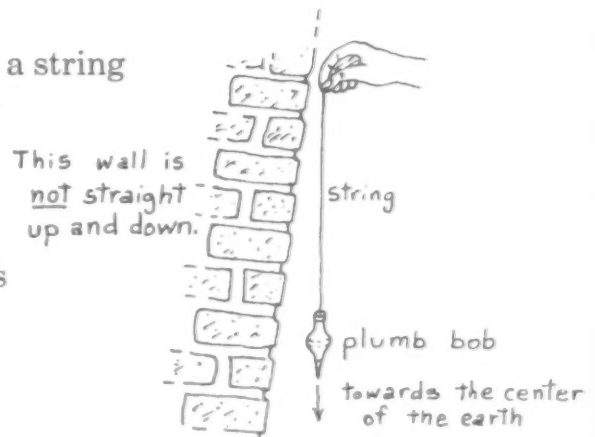
- Metal is **tempered** by heating and cooling it. Good blacksmiths know how to make strong well-tempered metal.

center of gravity – the point at which something is balanced

- A see-saw is balanced at its **center of gravity**.

plumb bob – a small weight hung on a string

- Masons use a **plumb bob** to be sure a brick wall is straight up and down. A plumb bob always hangs straight up and down because of gravity. Gravity pulls the weight down toward the center of the earth.



horsepower – a measure of power

- One **horsepower** is the power to lift 550 pounds one foot in one second.

Let There Be Light!

"Brothers and Sisters, I want to tell you this. The greatest thing on earth is to have the love of God in your heart, and the next greatest thing is to have electricity in your house."

Farmer giving witness in a church in Tennessee in the early 1940's



People have known how to make electricity for over 200 years. For a long time, it was hard to make a lot of it. There wasn't much use for it, either. Then the electric *generator* and the light bulb were invented. Everybody wanted electric lights. About 100 years ago, big cities got electricity. It was 50 more years before electricity came to small towns and farms.

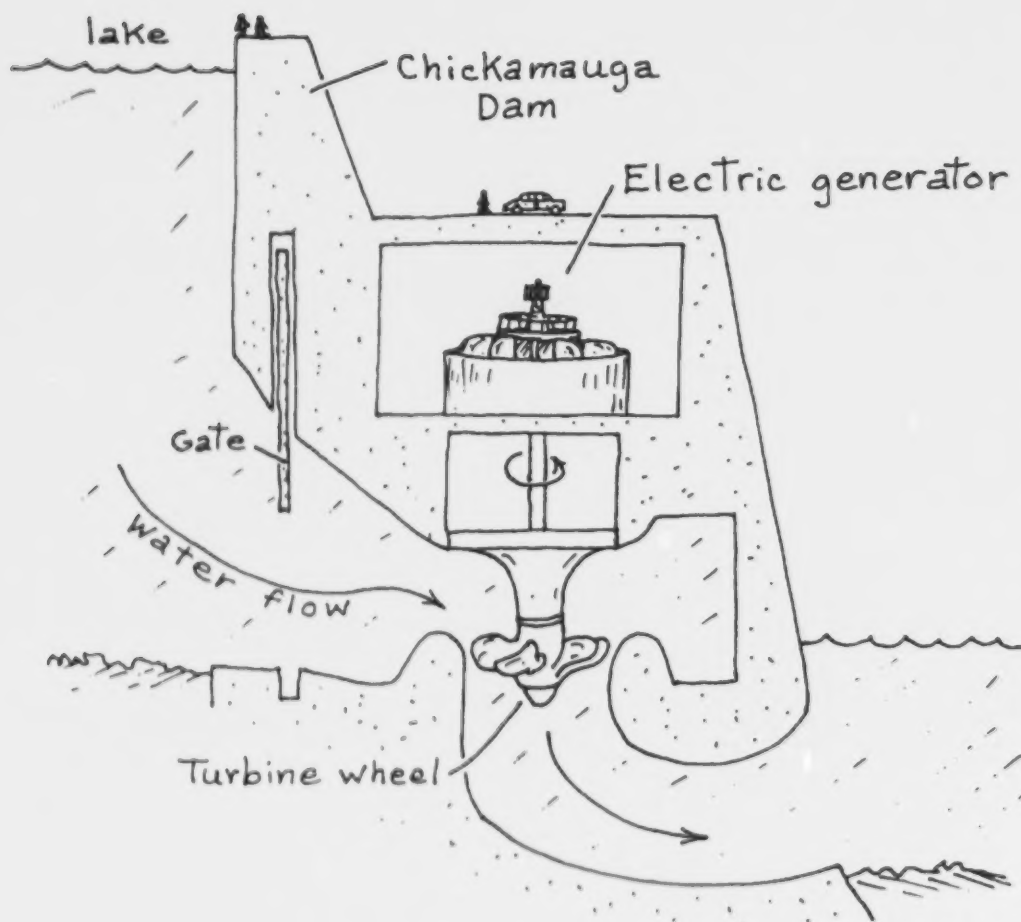
Thaxton Kell: "I remember when electricity first came to the valley. That was back in '39. They wanted people to sign for three dollars and a half a month. I remember hearing Dad and Mother talking about it. They said, 'Do you reckon we can afford it?' Three dollars and a half a month! Finally, enough signed up to get it put in. They started putting the lines in and wiring the houses. In the fall of '39 they got ready to turn the juice on. It was pretty late in the evening when they turned it on. The people from Dunlap who had cars took a tour and came all up and down this side of the valley. Everybody had their lights on. Well, that was back in 1939."

Electricity isn't hard to make. All you have to do is turn a generator. Magnets inside the generator turn and make the electricity. The engine of a car turns an alternator. It works like a generator. The alternator makes electricity which keeps the battery charged. Then the battery runs the car lights and radio. You can hook an exercise bike to an alternator and charge batteries while you lose weight.

A water wheel can be used to turn a generator. Turbines like the ones that turn the millstones at Ketner's Mill can be used to make electricity. It's easy to make your own electricity from running water. Just build a small water wheel. Set it in a stream by your house. Connect it to a car alternator. You can get enough electricity for electric lights or to charge car batteries.

Electricity made from running water is called hydroelectric power. In large hydroelectric plants they run water through giant turbines. The turbines look a lot like the one at Ketner's Mill. They work almost the same way. The giant turbines turn the generators to make the electricity.

It takes so much water to run these giant turbines that they usually have to build dams. The dams back up the water into lakes. Then they let the water out of the lakes through the dams. The turbines are



inside the dams. They turn as the water goes through them. You can take tours through most hydroelectric plants.

Hydroelectric power is very clean. It doesn't make any smoke or dangerous chemicals. But there are still problems. Dams cost a lot to build. Also, the lakes made by the dams cover a lot of land. People may have to leave their homes. Farms may be covered by the water. Rivers and creeks are flooded out. The

natural plants and animals of the area are killed by the lake water.

Of course, people like lakes. Lots of people go to lakes to swim, fish, boat, and water ski. Most of the lakes in Tennessee were made by hydroelectric dams. But what if they built a dam across the Sequatchie Valley? Instead of homes, farms, a river, and forests, we would have a lake!

TVA, the Tennessee Valley Authority, began building dams in Tennessee in the 1930's. They built the dams to stop the rivers from flooding and also to make electricity. Norris Dam was the first of the TVA dams. It was started in 1933. This was during the Depression. Everybody was looking for jobs. TVA hired local people to build the dam. Elmer Marsh was lucky to be hired.

Elmer: "I worked for TVA at Norris Dam when they first got started. I'd worked there one day when the boss came by. He said, 'Marsh, your record says you can read blueprints and you've been around building all your life.'

"I said, 'That's about the truth.'

"He said, 'How long you been laying brick?'

"I said, 'Hell, I cut my teeth on a brick!'

"He just laughed and said, 'Marsh, bring your tools.'

"I was scared. Man, they was standing in line at the gate by the hundreds then to apply for jobs. That was during the Depression. You couldn't buy a job. There wasn't none. But they made me a foreman. Gave me a crew. We built 300 houses up there at Norris.

"When they laid off all the brick layers, they kept me to the last man. The boss said, 'Marsh, I'm going to have to fire you. But I'm going, too. You're a good man. We're going together.'

"Then I worked at Watt's Bar hydroelectric plant. The generator room is lined with glazed tile. I did all the tile work. I'm proud of it."



Another man who was hired at Norris wrote this song.

TVA Song

My name is William Edwards, I live down Cove Creek way,
I'm working on a project they call the TVA.

The government begun it when I was but a child,
But now they are in earnest, and Tennessee's gone wild.

Just see them boys a-coming, their tool kits on their arm,
They come from Clinch and Holston and many a valley farm.

From villages and cities, a French Broad man I see,
For things are up and doing in sunny Tennessee.

All up and down the valley, they heard the glad alarm,
The government means business, it's working like a charm.

Oh see them boys a-coming, their government they trust,
Just hear their hammers ringing, they'll build that dam or bust.

I meant to marry Sally, but work I could not find,
The TVA was started, and surely eased my mind.

I'm writing her a letter, these words I'll surely say,
"The government has saved us, just name our wedding day."

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Well, he got his girl. But another worker at Norris
tells a sad story. The dam made him lose his girl.

She Sleeps Beneath the Norris Dam

Way down in sunny Tennessee
Beneath blue Dixie's skies,
In the silvery lake of Norris,
Where my poor darling lies.

I helped construct that tower of strength,
I worked from day to day,
Not thinking that the Norris Lake,
Would take my love away.

We went out in a motor boat,
Trying out its speed,
They told us it was dangerous,
But youth would not take heed.

The boat it gave a whirling swerve,
And threw an awful spray,
My darling she was gone from me,
When it had cleared away.

Take me back to Tennessee,
When I am free from care,
Lay me down in the Norris Lake,
So I can be with her.

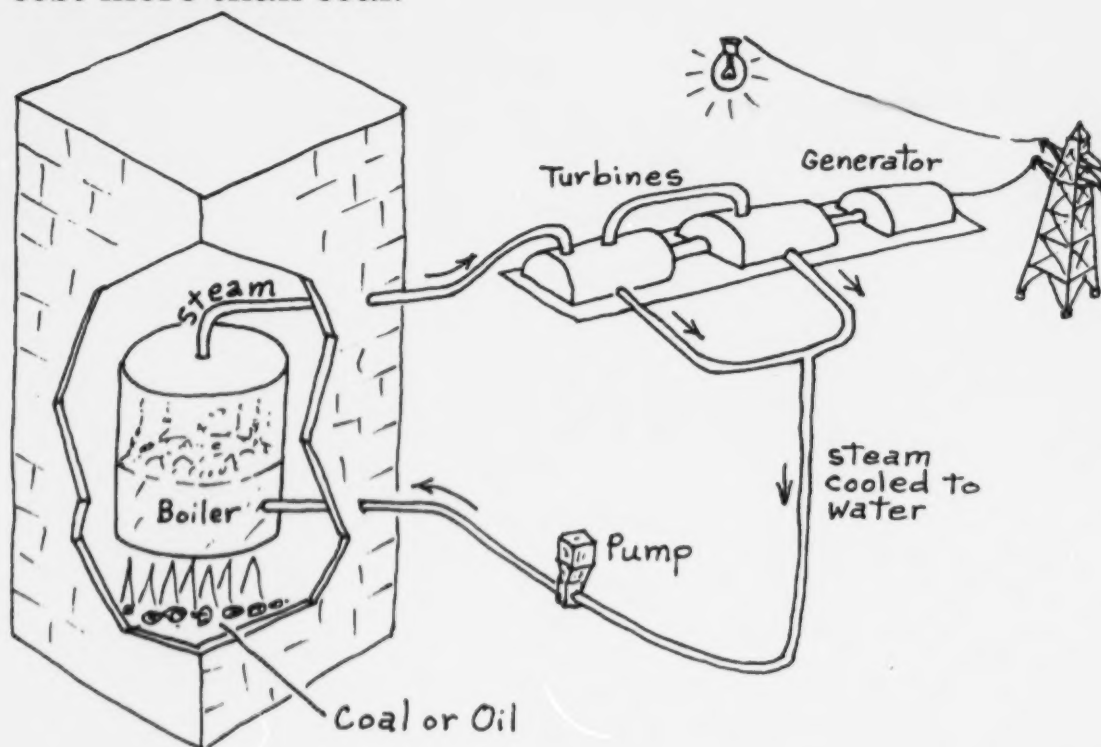
We'll both be in our watery grave,
I hope we won't be found,
We'll both be in our watery grave,
Above the Norris dam.

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Electricity From Steam

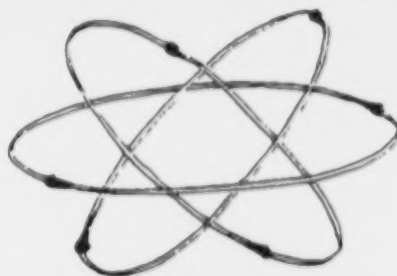
Turbines have to be turned to make electricity. The turbines can be turned by fast running water. They can also be turned by steam. Most electricity in the U.S. is made in steam turbine plants. The steam turns the blades of the turbine. The turbine turns the generator which makes the electricity.

It takes a lot of heat to turn water into steam in these plants. Coal, oil, natural gas, and nuclear power are used to heat the water to make steam. Most coal has sulfur in it. When it is burned, it causes air pollution. Oil and gas burn cleaner but cost more than coal.

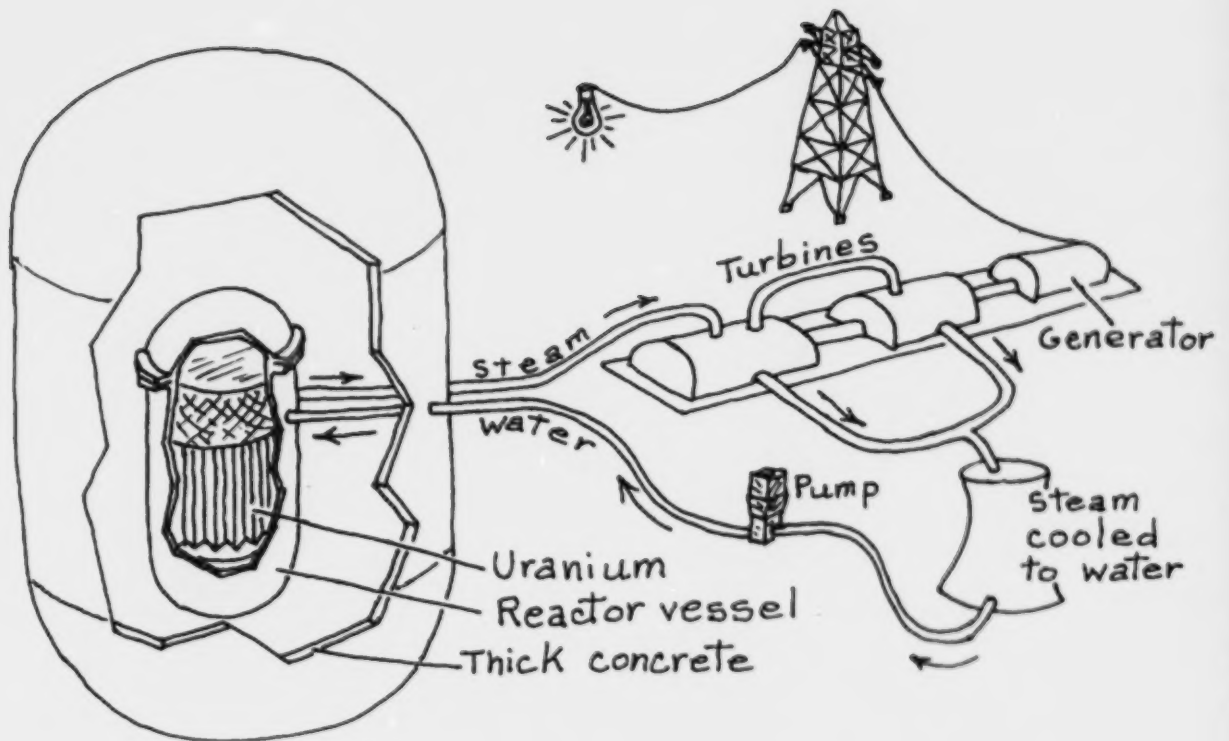


Nuclear power can also be used to heat the water. Sequoyah, Watt's Bar, and Brown's Ferry are all nuclear power plants. Nuclear power doesn't cause air pollution. But there are problems. It costs much more to make electricity from nuclear power than from coal.

Also, if something goes wrong at a nuclear power plant, it can be very dangerous. Nuclear power plants use uranium to heat the water. Uranium is a material that is mined out of the earth. It is radioactive. That means it gives off rays of energy all the time. The rays make some radioactive materials shine. Sometimes they put it on watches so you can see the numbers in the dark. Doctors use X-rays to look at the bones inside the body. But these rays can hurt living things. Large amounts can kill. Smaller amounts can cause cancer and birth defects.



Uranium in the nuclear plants gets very hot. It gives off a lot of heat and radioactivity. The heat is used to make steam. The power plants are built very carefully. They use thick concrete and layers of lead (a soft, heavy metal) to keep the radioactivity from getting out. They have a lot of safety systems. It



would be very hard for radioactivity to get out of the plant, even if there were an accident. Accidents don't happen very often.

In 1979 an accident did happen at the Three Mile Island nuclear plant in Pennsylvania. The safety system didn't work right. Some radioactivity got out into the air. Not enough got out to kill anyone. But the people who lived near the plant were very scared.

A much worse accident happened at a Russian nuclear power plant (Chernobyl) in 1986. It caused

radioactive dust to fall on Russia and Europe. The rest of the world also got small amounts of the dust. In parts of Europe, they couldn't let the cows out of the barns because of the dust on the grass.

Vegetables growing in the fields had to be thrown away. Many people who lived near the plant died. Hundreds of thousands of people had to leave their homes. For many years, people will die from the radioactive poisons there.

Another problem is the waste material. After the uranium can't be used any longer, it is still radioactive. It will give off dangerous rays for thousands of years. It is even dangerous to transport. The U.S. government tried to get Tennessee to store the waste. But the people of Tennessee said no. No one knows what to do about this problem.



Even mining uranium is dangerous. Some mines are in the southwestern U.S. The land where the mines are will be poisoned for thousands of years. Most of the mines are on land owned by Native Americans (Indians). The miners are more likely to get cancer than other people.

There are other ways to make electricity that are safe. The energy of the sun can be turned into electricity by using solar panels. Thousands of homes in the U.S. make all their electricity from the sun. Batteries store the electricity for night-time and for cloudy days. Solar panels cost a lot now but they will be much cheaper in the future. People who have solar electricity don't pay monthly electric bills! And there is no pollution or radioactivity.

In places where the wind blows a lot, wind turbines can make electricity. Solar and wind are renewable sources of energy. They will never be used up. Coal, oil, and uranium are not renewable. When we use them up, they will be gone forever.

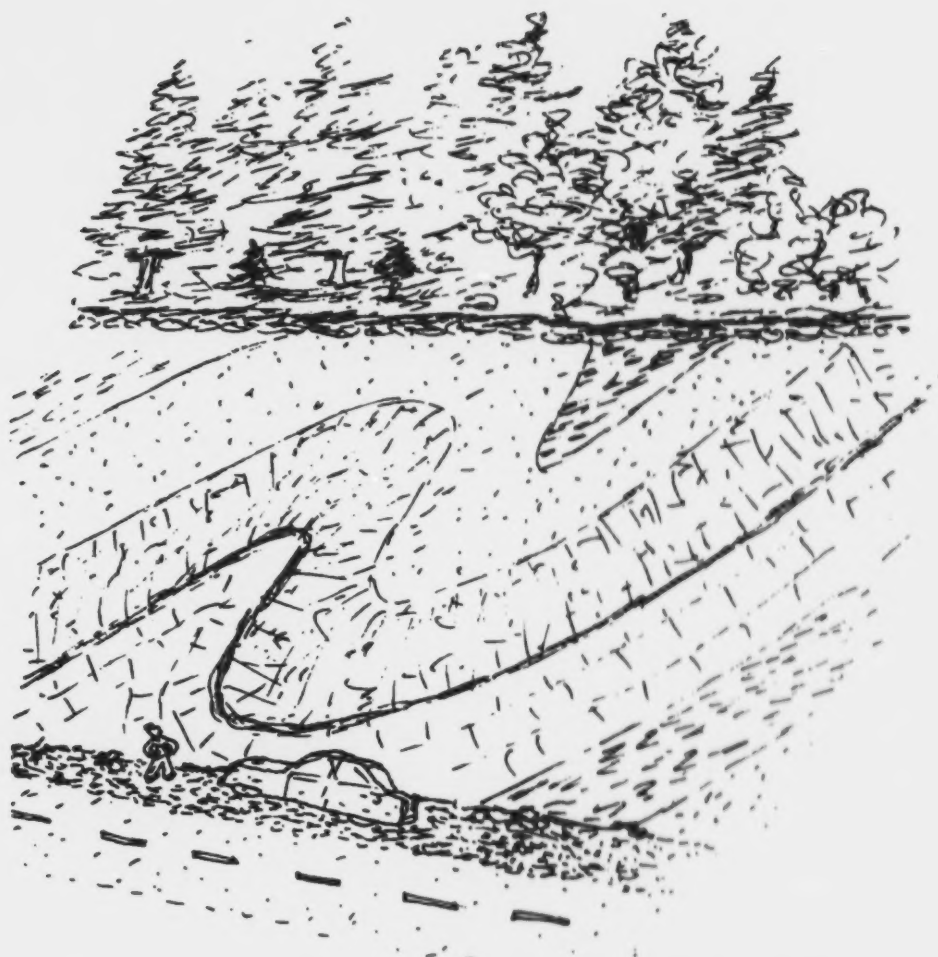
The best thing we can do now is to save electricity. Insulate your house. Use less hot water. Use fewer lights. Buy compact fluorescent light bulbs. They cost more, but they use less electricity. Use fans instead of air conditioners. Then the power companies won't have to make so much electricity. That will solve a lot of problems.

PART FOUR
Earth Science

What Made the Rocks?

Have you ever found the *fossils* of shells and sea animals in limestone rocks? Miners often find the marks of tree ferns and bark in coal. Sandstone rocks in tall bluffs sometimes have ripple marks like you see in the sand on a beach. Rocks that have been





bent into great folds can be seen where roads cut through the mountains. These clues all show how the rocks, coal, and mountains were made.

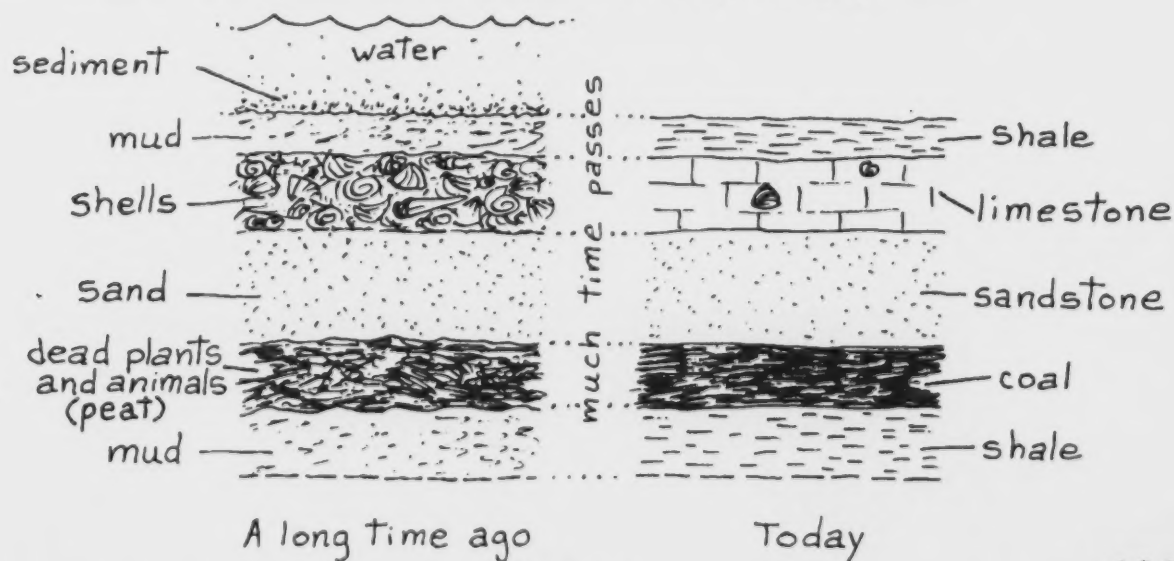
Hundreds of millions of years ago, Tennessee was very low, like Florida. The land was swampy, humid, and flat. Animals that looked like large lizards crawled through the swamps. Ferns grew thick and tall. Large trees with bark in the shape of diamonds grew next to shallow seas. Giant dragonflies flew

through the trees. There were no birds, no people, no flowers.

The shallow seas were quiet, clear, and rich in *lime*. The lime and the shells and skeletons of the sea animals slowly sank to the bottom. Around the seas were beaches of soft red sand. Rivers ran from the mountains down to the seas. They carried mud and sand which also sank to the bottom of the seas.

The trees and ferns died and fell into the swamps. The rivers flooded and covered the plants with mud. The level of the seas rose and covered the beaches, swamps, ferns, and trees. The plants that were buried didn't rot completely. They turned into a spongy brown stuff called peat. You can buy peat moss to use on your garden. It looks the same.

This went on for millions of years. More plants grew and died. Layers of sand, clay, and lime covered them. The plants were buried very deeply. The



layers are called sediments. The sediments were thousands of feet thick. In some places the layers were six to seven miles thick. The deeper layers were pressed down by so much weight that they hardened into rock.

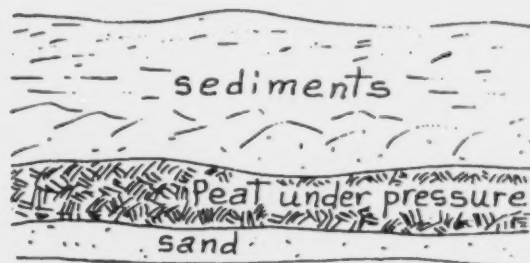
The layers of peat became harder and blacker. They finally turned into coal. It took about three to seven feet of peat to make a one-foot layer of coal. There are many fossils of ferns and tree bark in the coal.

You can see the beginning of coal now in Florida. Plants grow thick in the Florida swamps. They die and fall into the water. They slowly rot and become a brown, spongy material. It will be millions of years before this material becomes true coal.

The shells and skeletons of sea animals were



Dead plants and animals turn into peat.



Sediments cover and press the peat.



As time passes sediments turn into rock and peat turns into coal.

cemented together by lime and became limestone. It is hard and gray. You can see many fossils of sea animals in it.

The mud and clay hardened into layers of rock called shale. It is smooth like hard clay. It breaks easily into layers. The red and white beach sand became sandstone. It feels rough like sandpaper. Sometimes you can see where the sand was rippled by the water before it became rock.

If you look along a river after a flood, you will see layers of sand and clay washed down from the mountains by the rain. Sometimes you can see ripple marks in the sand. Every year, more sand and clay are washed down into rivers and onto low land. After millions of years, these layers of sand and clay may become layers of sandstone and shale. Millions of



years in the future some farmer may pick up a piece of sandstone. He may find a Coke (or Pepsi) can inside of it. He'll shake his head. "I wonder what that could be?" he'll say.

Information, Please

lime – a mineral found in sea water; a chemical made by heating limestone

- Limestone rock is made of **lime**. The lime in sea water falls to the ocean floor. After millions of years, it becomes limestone. Most shells are made of lime. Cave formations are made of lime.

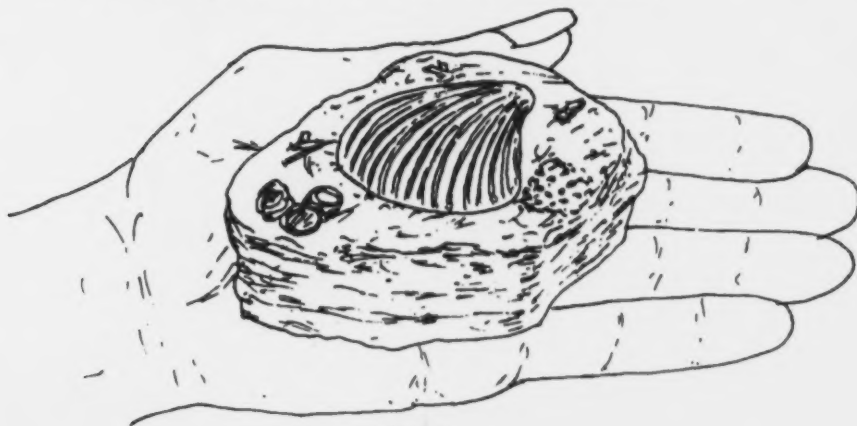
Limestone is heated to make hydrated lime. Hydrated lime is used by farmers to make their soil less acidic. Water treatment plants use it to make the water less acidic. It is also used to make cement and mortar.

fossil – the hardened remains or marks of animals or plants that lived millions of years ago

- If a leaf falls in wet cement, it leaves a mark. In the same way, you can see the marks of ferns in coal. The ferns rotted away millions of years ago, but their marks remained.

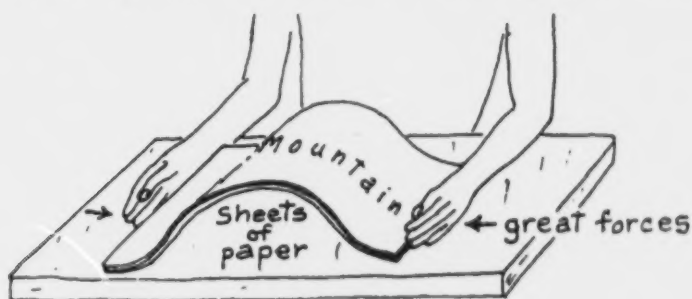
Sometimes, the plants or animals became rock. If a tree fell into a swamp, it didn't rot. It was buried under water then under mud and sand. The chemicals in the water took the place of the wood. The shape of the tree stayed the same. The wood became rock. This is called petrified wood.

In the oceans, the bodies and shells of sea animals fell to the bottom. They were covered by rock, sand, and clay that flowed into the sea. After millions of years, the shells and bodies of the animals changed to rock. These are **fossils**.



The Mountains Rise

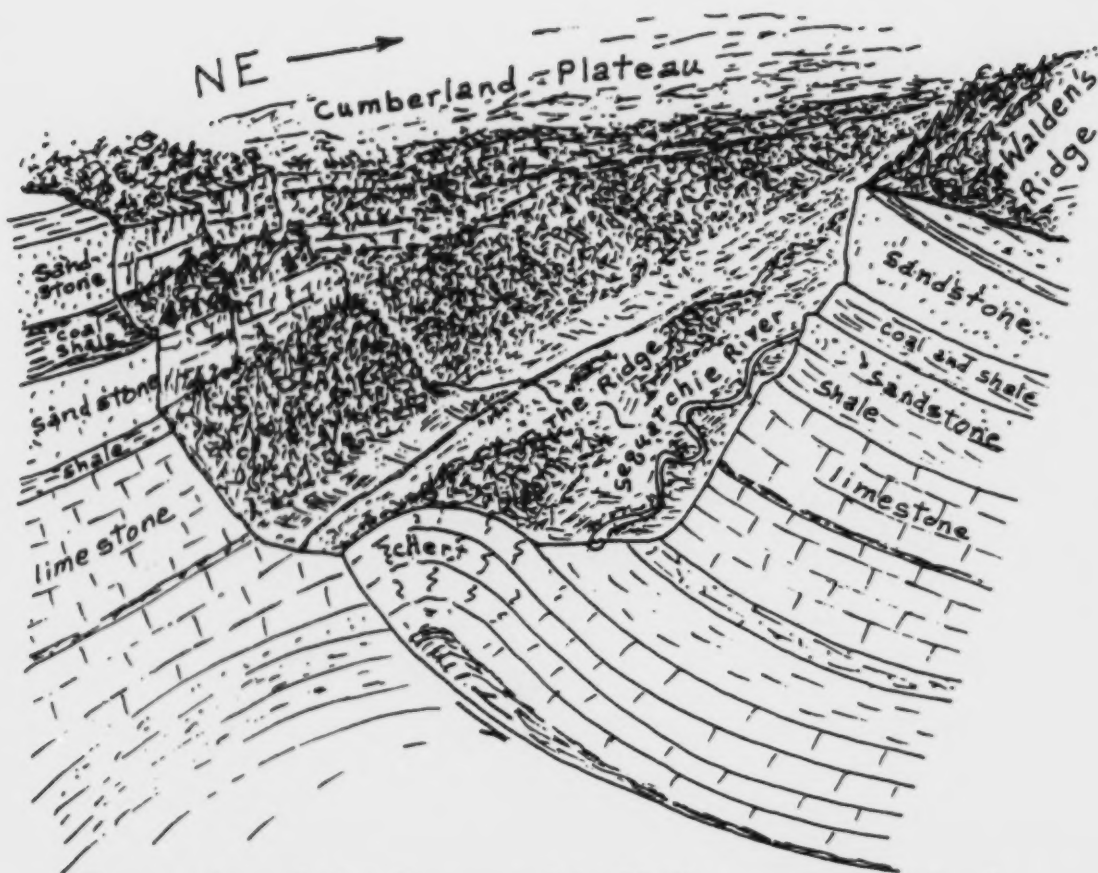
For millions of years, the land in Tennessee and the eastern United States stayed low. The seas and swamps were quiet and still. Then great forces began



Mountain building.
Show yourself how it works.
Let the sheets of paper be
rock layers of shale, clay, coal
and limestone.

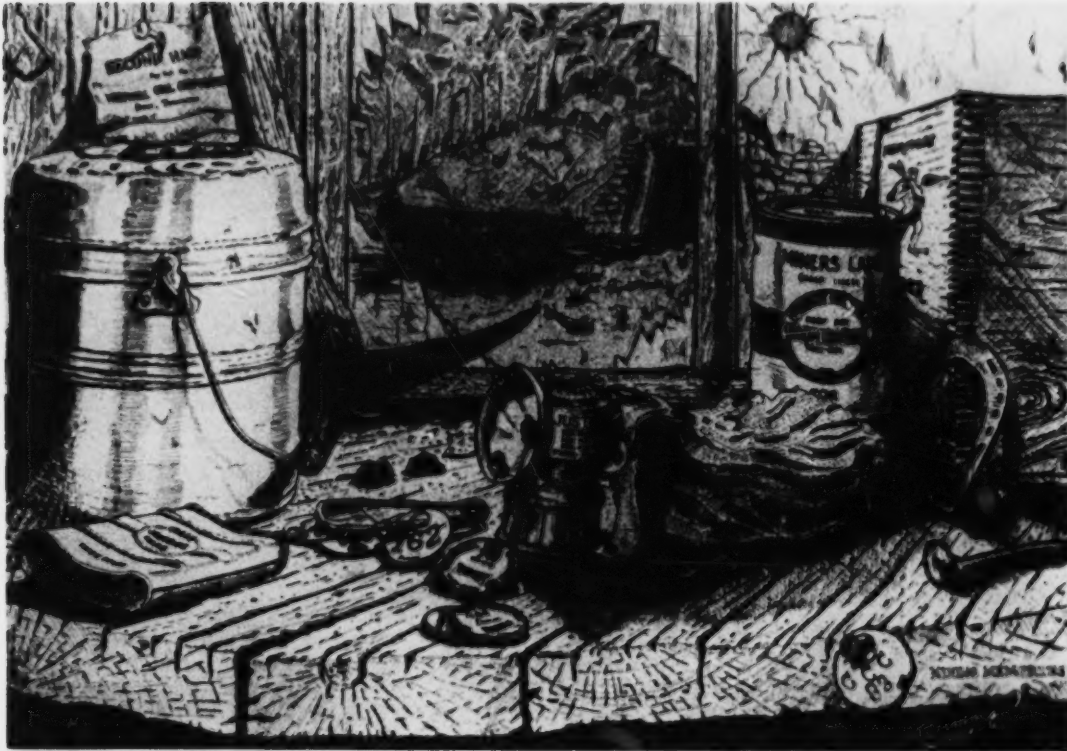
working under the earth. The land was pushed upward by these forces. The seas and swamps disappeared. The deep layers of rock were under great pressure. They bent and folded like soft clay or plastic. High mountains formed.

Rain fell on the mountains and formed great rivers. The rain and the rivers wore away the softer rocks and made valleys. The hardest rocks became bluffs and ridges. This happened very slowly. It is even happening today. Earthquakes are caused by the earth moving. But one earthquake only moves the rocks a small amount. It takes millions of years to move rocks enough to make mountains.



The rocks of the Sequatchie Valley were pushed up into a great fold. The softer rocks on the top of the fold slowly washed away. The Sequatchie River began to run down the center of the fold. It ate down through the layers of rocks. After many years, the valley was dug out. The ridge down the center of the valley is made of a very hard layer of cherty rock. The river couldn't wash it away. The hard sandstone was left as bluffs on each side of the valley. Above the bluffs on Walden's Ridge and the Cumberland Plateau were thin layers of coal between layers of shale.

Black Gold



Farmers and blacksmiths knew about the coal of the Cumberland Plateau even before the Civil War. They dug the coal to heat their forges and burn in their stoves. About 1850, businessmen found out about the coal. Coal was becoming important. People were beginning to use it to heat homes and run trains and factories. By 1900, they needed it to make electricity. They started mining near Tracy City. Railroads were built to ship the coal.

Between 1900 and 1920, mines were opened just above the bluffs along the Sequatchie Valley. There were no roads or railroads to these mines. The coal

was sent down to the valley in large cars on tracks. The tracks went straight down the mountainside. This was called an incline. Each car carried seven tons of coal. Gravity pulled the heavy cars down the



The incline railway up Fredonia Mountain to Number Two coal mine – about 1920

inclines to the railroad in the valley.

There have always been many problems with coal mining. Coal miners sometimes make a lot of money. But it's not an easy way to make a living. Sometimes the price of coal drops. Then they stop mining it for a while. When the coal is all mined out, the mines close forever. In both cases, the miner is out of a job. The mine owners have made their money.

Underground mining is dangerous in many ways. Many miners have been killed in accidents, cave-ins, and explosions. In 1902, a gas explosion in a mine near Lake City, Tennessee, killed 184 miners. Some miners were trapped and lived as long as eight hours before they died. Many of them wrote letters



to their wives while they waited to die. This song was written about them.

Shut Up in the Mines of Coal Creek

Shut up in the mines of Coal Creek,
We know that we must die,
But if we trust in Jesus,
To Heaven our soul shall fly.

Our lamps are burning dimly,
My food is almost gone,
This gas is sure but awful,
Soon we'll be carried on.

Goodbye dear wives and children,
May you be treated kind,
For now our time has come to die,
Shut up in the Coal Creek mines.

Eleven of us were imprisoned,
And two dear ones have died,
Nine more are left to suffer,
And die in the Coal Creek mines.

Farewell dear wives and mothers,
You are left behind to mourn,
But if you follow Jesus,
We'll meet in heavenly home.

Dear friends you should take warning,
And listen to what we say,
You are now in a world of sunlight,
And there you had better stay.

Goodbye dear wives and children,
May you be treated kind,
For now our time has come to die,
Shut up in the Coal Creek Mines.

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Even breathing the coal dust is dangerous. Many older miners have a disease called black lung. It causes people to have trouble breathing. The government now gives money to people who have black lung. Silicosis is another lung disease caused by dust in some mines. Five hundred miners who



Coal miner on Brockdell Mountain as he shovels coal. Notice carbide lamp and soft leather cap. Both are outlawed in today's mines. Picture made around August 1956. Photo is of John Myers.

worked in one mine in West Virginia died of it. This song was written about them.

Silicosis Is Killin' Me

I say, Silicosis, he made a mighty bad break of me,
Aw, Silicosis made a mighty bad break of me,
You robbed me my youth and health,
All you brought for me was grief.

Now Silicosis, you're a dirty robber and a thief,
Aw, Silicosis, dirty robber and a thief,
Robbin' my right to live
And all you brought for me was grief.

I was there diggin' that tunnel for six bits a day,
I was there diggin' that tunnel for six bits a day,
Didn't know I was diggin' my own grave,
Silicosis eat my lungs away.

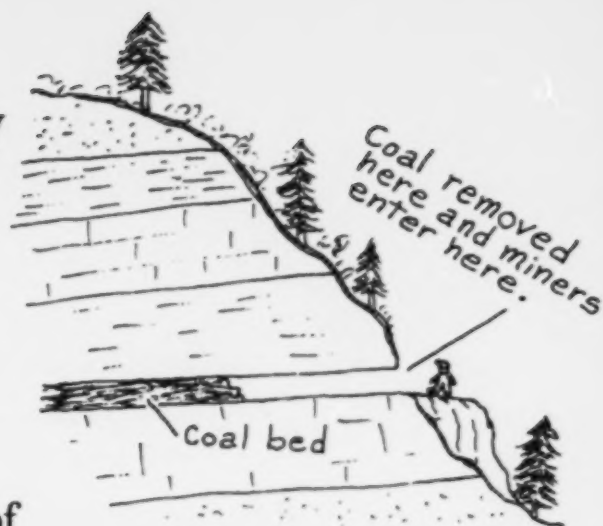
I said Mama, Mama, Mama, cool my fevered head,
I said Mama, Mama, come and cool my fevered head,
I'm gonna need my Jesus,
God knows I'll soon be dead.

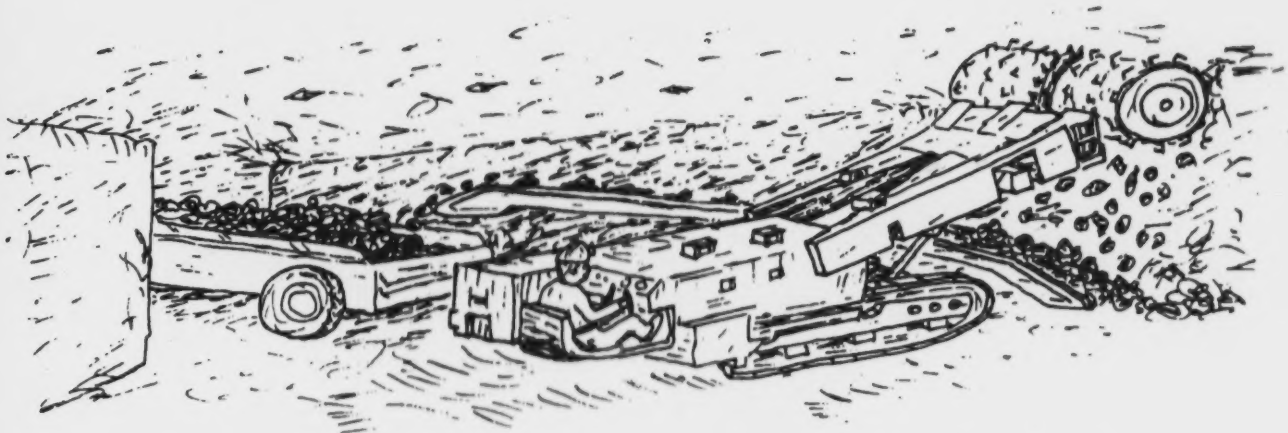
Six bits I got for diggin'; diggin' that tunnel hole,
Six bits I got for diggin'; diggin' that tunnel hole.
Take me away from my baby,
It sure done wrecked my soul.

Now tell all my buddies, tell all my friends you see,
Now tell all my buddies, tell all my friends you see.
I'm goin' way up yonder,
Please don't weep for me.

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Underground mining today is much safer and easier than it used to be. The miners mainly operate machines that dig and carry the coal. They use masks to keep out the dust. They use electric head lamps instead of carbide lamps. A carbide lamp has an open flame. It could cause an explosion. They use large fans to blow the dangerous gases out of the mines. They have many laws about safety. There are still some accidents.





An explosion of methane gas caused the death of 13 miners in a Marion County mine on December 8, 1981. This song was written by Edward Brown, a Dunlap musician.

NUMBER TWENTY-ONE
(Marion County Mine Disaster)

CHORUS

Some were buried on the mountain, some the valley below
Thirteen men died a tragic death while digging for the coal.
Way down in that Marion mine striving for the ton,
Thirteen miners lost their life in Number Twenty-one.

Deep within this old earth the methane was there,
A gas that is so deadly with a spark it is a fire.
Who knew the fate of the thirteen that day?
As they went down in Twenty-one to dig for their pay.

Whitwell lost five miners and Tracy City three.
Brothers from near Dunlap, such a tragedy.
Laager in Grundy gave two they loved so well,
A leader from Jasper filled that tunnel of death.

Number Twenty-One, music and lyrics by Edward Brown
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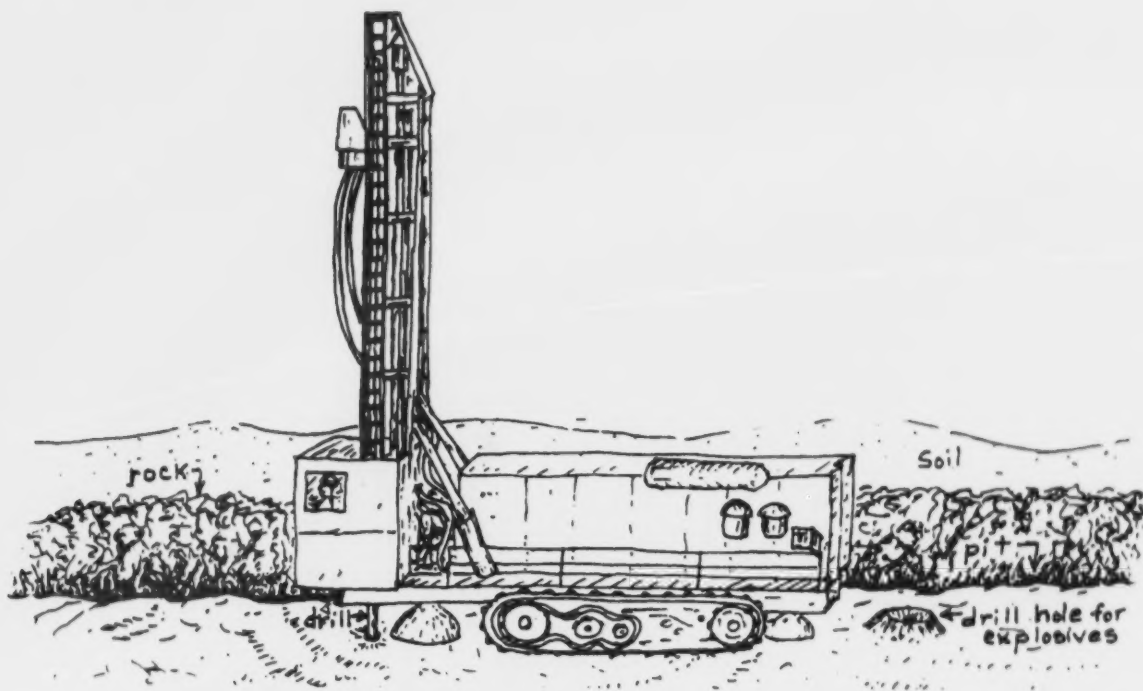
Modern Coal Miners

On the Cumberland Plateau in eastern Tennessee, coal is found about 80 to 120 feet under the ground. It is in a layer called the Sewanee coal seam, which is only about 25 inches thick. In some places the coal gets even thinner or disappears completely. It is a soft coal and is mainly used to make steam for electricity. Some of the coal is used by factories like DuPont to make nylon, plastics, and other products.

Since the coal is in a thin layer and not very deep, they don't use tunnel mining. They dig it out by surface (strip) mining. Strip mining is not as dangerous as underground mining. There aren't any tunnels. The miners don't work underground. All of the rock above the coal is dug out. Then the layer of coal is taken out. The rock is then dumped back in. Good soil is bulldozed over the rock, and grass is planted.

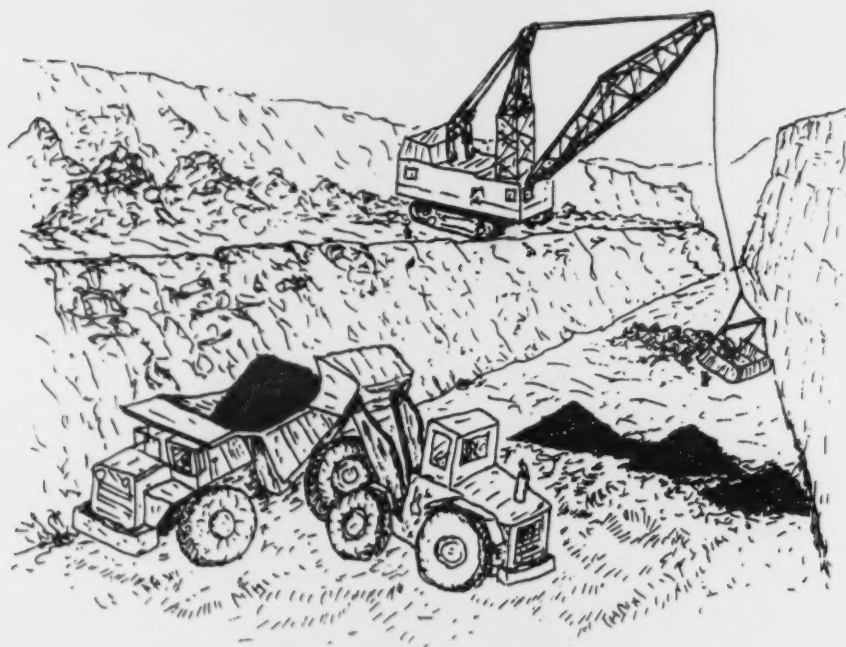
Before they start digging, they drill test holes and draw maps of the coal seam. They decide where to start digging out the coal. They pick out a strip of ground one mile long and 95 feet wide. All of the trees are bulldozed up. The good soil is bulldozed into large piles.

Holes are then drilled down to the coal. The holes are 18 feet apart all along the one-mile strip of land. Explosives are placed in the holes. Thirty holes are set off almost at the same time. People who know how to work with explosives do this. They are very good at it. They can make all of the rock above the coal break off in one line.



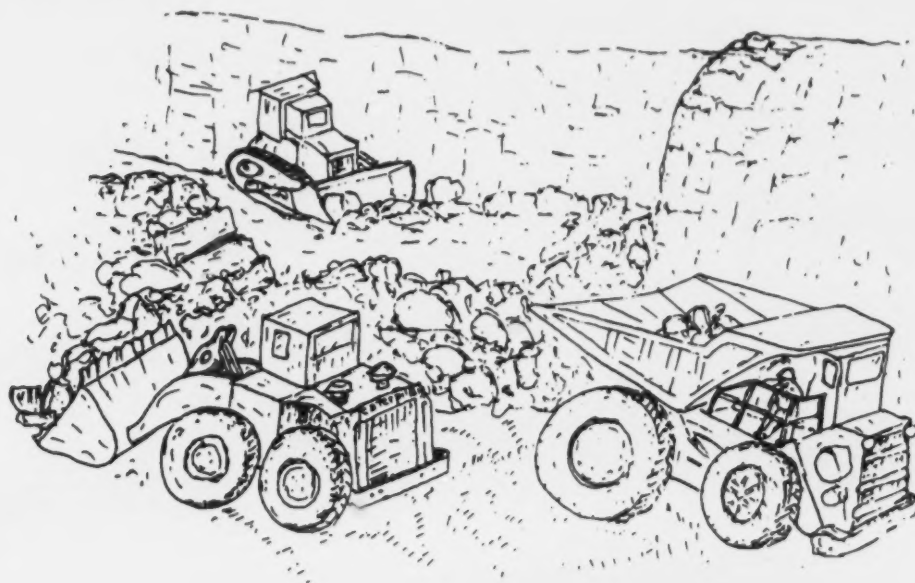
After the rock is broken up, it can be dug out. Large bulldozers and machines called drag lines dig it out. Drag lines are giant shovels which can pick

up 18 cubic yards of rock in one shovel load. That would fill a small bedroom! The rock is then dumped into large trucks. They are called rock trucks or Eukes. One of these trucks can carry 85 tons of rock in one load. It takes a lot of loads to haul all the rock out of a pit which is 95 feet wide, one mile long, and 120 feet deep. The rock is put in large piles.



When all the rock above the coal is hauled off, the coal can be dug out of the bottom of the pit. A skilled operator does this work. He knows what to look for. He only picks the best coal. He shovels it up with a front-end loader and dumps it into a

Euke. The Euke carries it up out of the pit and dumps the coal into a coal truck. The coal trucks carry the coal to the buyers.



Finally, all the coal is taken out of this pit. Then another strip of rock will be blasted off. It will be along the first pit and will also be 95 feet wide and one mile long. This time the broken rock will be used to fill up the first long pit. They will keep taking off 95-foot wide strips as long as the coal seam is good.

Many years ago, this would have been the end of the work. The coal was carried away, and the piles of rock were left behind. Beautiful forests became bare hills of rock and clay. Nothing could grow there. The mountain streams were poisoned by acid

from the coal. The fish and other living things in the streams died. You can still see these ugly hills on the Cumberland Plateau. Pines have been planted on some of them, but they don't grow well without soil.

Finally, people began to complain about what was happening to the land. They began to ask questions. Did coal companies have the right to turn thousands of acres of woodland into desert? The mine owners told them that they owned the land. They said they didn't have to recover it. Besides, the mine owners said they didn't have enough money to turn the land back into forest again.

Now there are many laws about surface mining. The mine owners can't leave ugly hills of bare rock and clay. It takes a lot of time and money to recover the land. After the pits are filled up with the broken rock, the rocks are bulldozed into rolling hills. Clay and good soil are bulldozed over the rocks. Grass seed, fertilizer, and hay are spread over the soil. After a year or two, the land is covered with grass. There are no dogwoods or redbuds, no Mayapples or spring beauties, no giant oaks or rough pines. But the land is not left bare and ugly.

There are very strict laws about surface mining and water. The pits can't be dug across any large streams. The water pumped out of the pits contains

acid and toxic (poison) metals from the coal. It must be purified. It is pumped through limestone to get rid of the acid. Then the water is put into settling ponds. The iron and other metals settle out in the ponds. The water from the ponds is drained into a wetland. This is a swampy place with many plants growing in it. Nature cleans the water in wetlands. Many toxins are removed. Water from the wetland can be returned to the natural mountain streams. The living things in the streams will not be harmed by this water.

Most of the mine owners want to put the land back in good shape. But a few still don't want to take the time and spend the money. Small mining companies sometimes strip an area quickly and leave. The mine inspectors may not catch them. U.S. Government money is used to recover some of this land and the land from the older mines. Mine owners who reclaim their land are proud of the way it looks after a few years. The grass grows so well that they cut it for hay and use it on the next area they have to recover. The deer come to graze on it. We have used the coal for our energy needs. The land has been saved for our children although the beautiful forests will not return for hundreds of years.

The Coke Ovens

About 75 percent of the coal mined in the U.S. is burned in power plants to make electricity. Some is used for heating. Some is used for making medicine, dyes, fertilizer, road tar, cloth, perfume, and plastics. About 15 percent of the coal is used for making coke.

Coke is a fuel made by heating coal without air. It burns hotter and cleaner than coal. It is used for making iron and steel.

Before 1700, charcoal was used in England for making iron. Charcoal is made by burning wood without air. But by the 1600's, most of the forests in Europe were cut. It was hard to get charcoal.

People who made beer (brewers) used charcoal. When they couldn't get charcoal any more, they tried to use coal. But it gave the beer a bad taste. So they tried heating the coal in a closed oven without air. What they got was a gray, hard, light material. It had lots of little holes in it like a sponge. It burned hotter than coal, with a blue flame, and with almost no smoke. They had found out how to make coke! And it worked in the beer.

Soon the iron makers heard about the coke. They tried it. It worked better than charcoal. After that, coke became very important for making iron and steel.

After the Civil War, many coal mines opened in Grundy County, Tennessee. They mined so much coal that they couldn't sell it all. So they tried making coke with it. Blast furnaces were built to start making iron. The iron-making industry was never very successful there. But they kept making coke. They built over 200 coke ovens in Dunlap. The ovens are still there. The area is now a National Historic Site.



The ovens were made in the shape of old-time beehives. Each oven was 12 feet across and six feet high. They were built of brick. A train track ran on top of the row of ovens. A small train called a dinkey carried coal to the ovens. About six tons of coal were

dumped from the train cars into the top of each oven. Then they lit the coal. When it started burning, they closed the ovens. The coal burned as hot as 2000° for 72 hours. That was hot enough to turn the inside of the brick ovens into glass. You can still see the glass-coated bricks in the ovens.

In 1917, a black child was killed in Dunlap riding on a dinkey train.

"DINKEY" CAR KILLS A BOY

Dunlap, Tenn., July 31 – Frank Sellers, son of Mr. and Mrs. Will Sellers, is dead as the result of an accident at the Chattanooga Iron and Coal Corporation's coke ovens at this place. He tried to mount a "dinkey" car in motion when his foot slipped, the car crushing his right leg and hip and causing injuries from which he died in about a half hour. His father is an employe of the corporation, but the boy, who is only 12 years old, was not employed.

Sequachee Valley News
August 2, 1917

Edward Brown, a Dunlap musician, wrote this song about the men who worked in the coke ovens.

Coke Oven Slave

Chorus

Early in the morning, till the sun goes down,
We fired the coke ovens, both white man and brown.
We toiled and we labored – no money could be saved.
Sunup to sundown, I was a coke oven slave.

First verse

On top of Fredonia was the number two mine,
Leading down the mountain was a railway incline.
At the bottom of the mountain, coke ovens in rows.
It took 300-plus to make that operation flow.

Second Verse

It took sweat, blood, and tears in the mine to get coal,
Into the tippie, in cars and down the slope.
Pulled coke from the ovens, yes, I labored every day,
Slaved o'er the beehives for very little pay.

Third Verse

That mass of cold stone sits alone and sad,
A reminder of the past, whether good or bad.
Listen to the voice of the stone gently tell
Of men and their labor, of joy and of death.

Coke Oven Slave, words and music by Edward Brown
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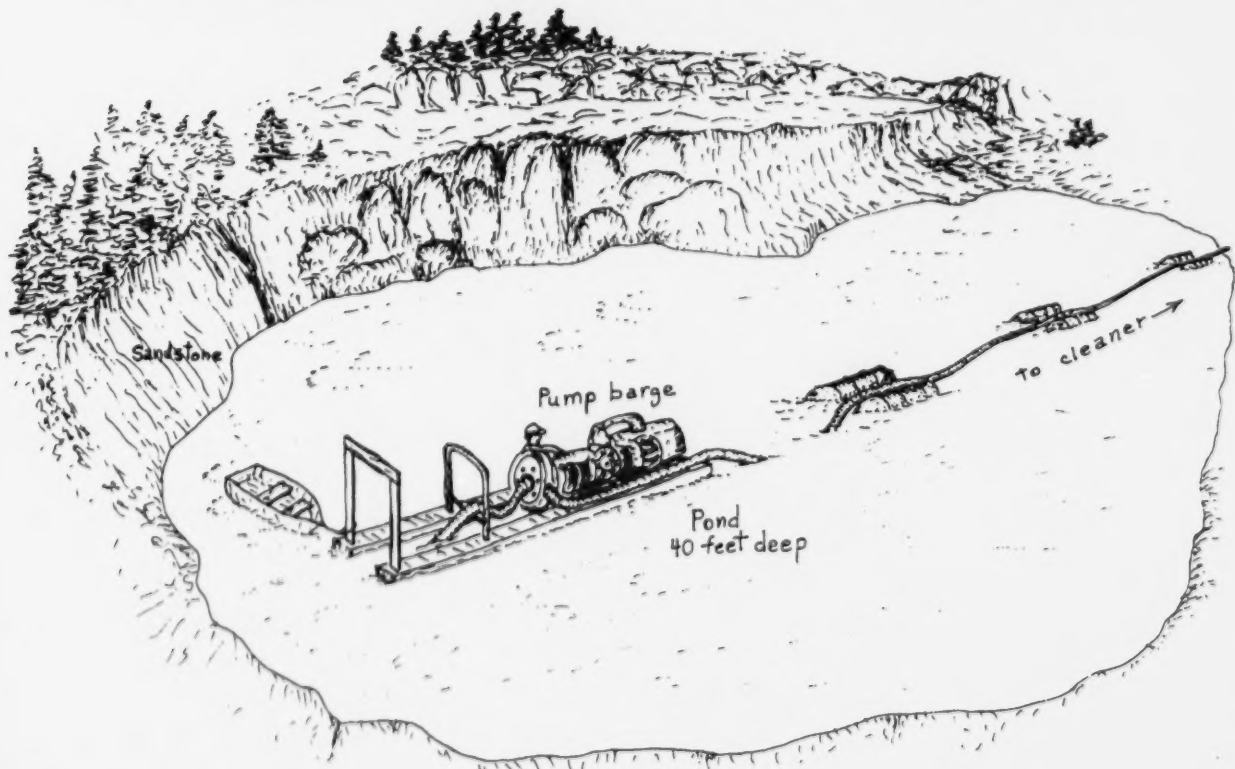
In the 1920's, the coal mines, coke ovens, and the Chattanooga blast furnaces were all closed. The miners and workers were out of jobs.

The Sand Pits

Coal is not the only useful material found in the rocks of the Sequatchie area. Some of the sandstone on Walden Ridge is very soft. It breaks down into sand easily. Builders always need good sand.

Elmer Marsh owns and operates a sand pit on Lewis Chapel Mountain. The sand is very fine and pure. Builders in Chattanooga and the Sequatchie Valley get sand from him. This is the story of how he made the sand into a money-making business.

Elmer Marsh: "When I was doing some contracting for brick laying, someone told me there was a sand pit on Lewis Chapel Mountain that just wouldn't



quit. Well, I checked it out. I got to using it. It was awful good sand. The other brick layers thought it was good. I ended up buying the sand pit."

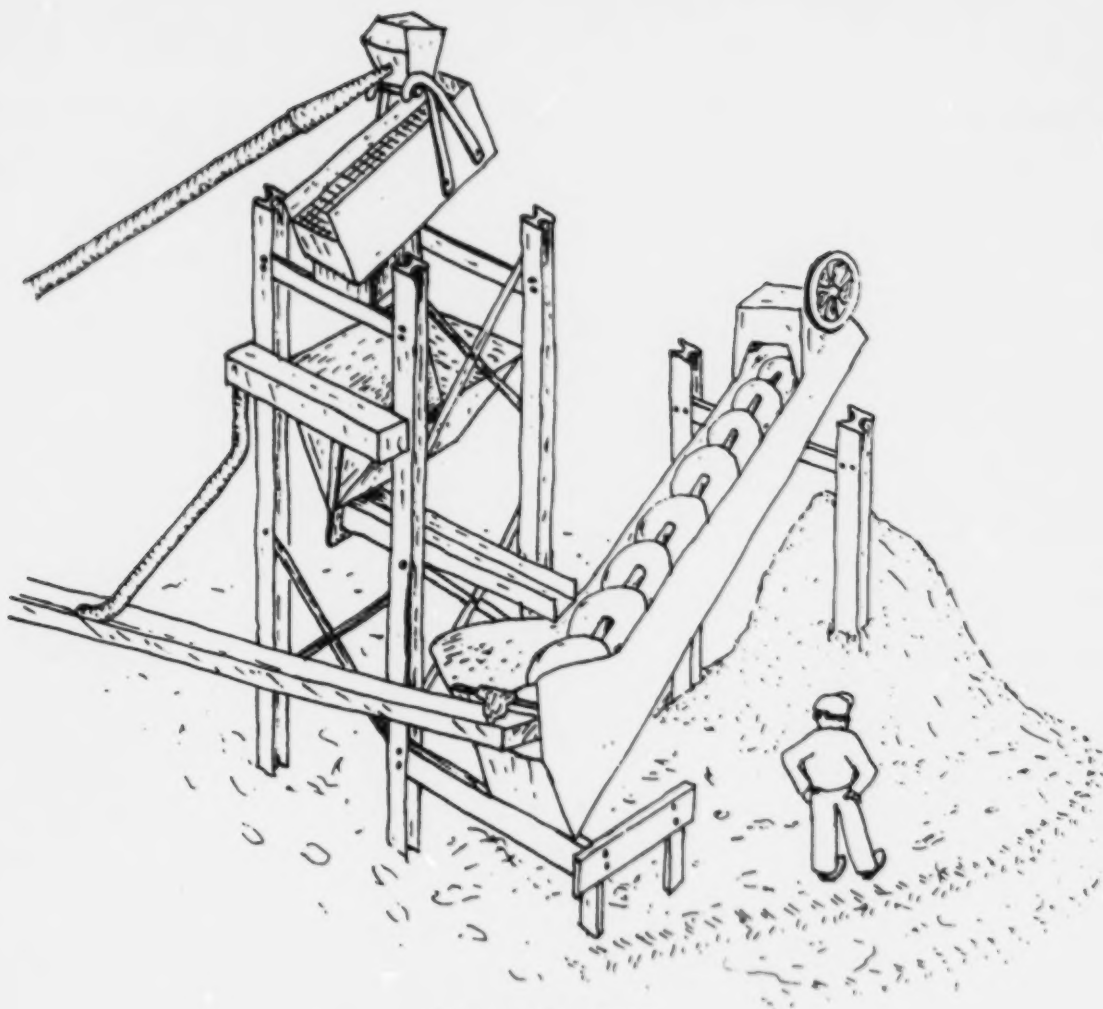
Mrs. Marsh: "It was just like a wilderness here when we first bought it. That was in 1940. A man stayed up here in a little shack. His wife was an Indian."

Elmer Marsh: "At first, we just dug the sand out of the bank and screened it. I started trying to work out a better way to process it. I had to get the right size sand. I had to get the dirt out of it. That's my number six try out there now. I've built five others. I'd build one, it wouldn't work good. I'd figure out another one. I'd borrow the money and build it.

"I went down to North Carolina to look at a plant there. I got their plans and built that. It worked pretty good. But I wasn't satisfied. So I kept changing it. Finally, I came up with the one I have here now. We can run up to 450 tons in a day with one man sitting on a barge out there.

"We began to make some money. But it's either feast or famine. Either everybody's building or no one is.

"We sell to the U.S. Government, the State, the City of Chattanooga, and the contractors. This sand is approved by the architects in Chattanooga. It's



The number six try

processed to be 98 percent pure sand. It's good for brick work and masonry.

"We tried delivering the sand ourselves for a while. But we had problems. My drivers would get drunk and wreck my trucks. One time, a neighbor was up against it for a job.

"He said, 'I've got to have a job, man.'

"I said, 'I know you're a good truck driver. But you can't let that bottle alone. If you'll promise me

you won't drink while you're driving, I'll hire you. If you want to drink, that's your business. You lay off that day. Get drunk. I don't care. But don't drive my trucks. You'll get me in trouble.'

" 'All right,' he said.

"Well, in about two weeks he come up and said, 'I've fouled it up.'

"I said, 'How bad did you wreck it?' I knew he'd wrecked the truck. He was still groggy. Just drinking on the job. Well, he'd turned it over. It cost me \$2,250 to get it put back together. It bent everything on it. So we quit delivering.

"It was all a challenge to me. I threw a lot of money down the drain before I came up with the right answers. I'm getting on up there or I wouldn't want to sell it now. I'm 79 years old. Everything still works, though! (He laughs.) Some man that had some money and some git could take this place. It'd be a gold mine."

Elmer was a brick layer most of his life. Here is how he learned the trade.

Elmer: "My father, my grandfather, all my cousins, and my mother's people were all brick layers. My dad laid the bricks for the army camp at Fort Oglethorpe during World War I. I was just a boy. My dad said, 'I don't want you to be setting there in

the shade doing nothing. You go around and take these people water.'

"He wanted to teach me to do a job. So I carried the water to the men. They paid me \$1.50 a day. Paid me in silver dollars. When I got older, I'd help with the bricks. I'd mix the mortar and carry it. I always worked with brick layers when I wasn't in school.

"I got my brick layer's card when I was 17. I've seen a lot of guys just come in and pick up the brick trade for the money, with no experience. But you got to grow up around it to be good. A good brick layer can just shut his eyes and see things that ain't there. He's got to be able to see what that wall is going to look like when he gets done.

"I went to Detroit, Michigan, to work when I was 20. Wasn't much work in Chattanooga then. I got a job the first day. Worked on the Hudson car building. They paid more up there. I joined the union as a journeyman brick layer.

"We worked on a swinging scaffold. The scaffold was held by cables. The cables were fastened to the top of the building with winches. They would winch up the scaffold as the brick wall went up. It was zero degree weather. The scaffold was covered with canvas. We worked under the canvas. We had a

salamander. That's a small heater that burns coke. It didn't make any smoke, but the fumes were bad. It'd give you a tizzy.

"I've seen some pretty rough winters here. But nothing like up there. When it freezes over, it stays ice all winter. We'd cut up in our cars on the ice. You could slide a half a block before you stopped. We'd tighten one brake more than the other. We'd hit the brakes and slide. The car would spin around and go back the other way. We was just young kids. It's a wonder we didn't get killed.

"In Chattanooga, I was in the brick contracting business. I built Woolworth's, McClellan's, the Nazarene church, Brainerd Baptist, and Northside Baptist. I could name them all day.

"The quality of work today is a lot different from the way it was then. They get by with work today we'd never have done. It's not plumb or level. They leave different sized joints and chipped brick. Back then, people took more pride in their work whether they was a carpenter, plumber, or whatever. Them old people had the idea that a job had to be done right. Anything worth doing was worth doing right. People would lay two to three times as many bricks an hour as they do today. And they're getting lots more wages today. They used to get \$1.00 an hour. Now it's \$15.00 an hour.

"Nowadays, they'll just do a job anyways. Just get a job done. Get the money and get gone. They get by with a lot now they wouldn't have back then."

Elmer Marsh helped his father from the time he could carry a brick. Even when he was a boy, he was a hard worker. But there was one thing he didn't want to do. He didn't want to go to school.

Elmer: "I used to play hooky and that's the reason I don't know nothing now! (He laughs.) I'd have just rather took a kicking than set in that school house all day. It'd confine me so I'd be in a terrible shape. I'd go just for a week or so. Then I'd lay out. I wasn't sick, I was playing hooky."

"I played hooky for six weeks before they caught me one time. They knew there was something wrong, but they couldn't figure it out. My mother and dad would take me to the school house. They'd watch me go in the door. But I never was in school."

"Well, this is where I was. On two sides of the building the floor was up about five feet. There was a door that went in under the school, into a sort of cellar. I found a skeleton key that fit that door. We'd fool around till just after school took up. Then me and four or five boys would sneak in there. We'd lock the door behind us."

"There was a high stone wall in the cellar. It led to another part. There didn't seem to be any way

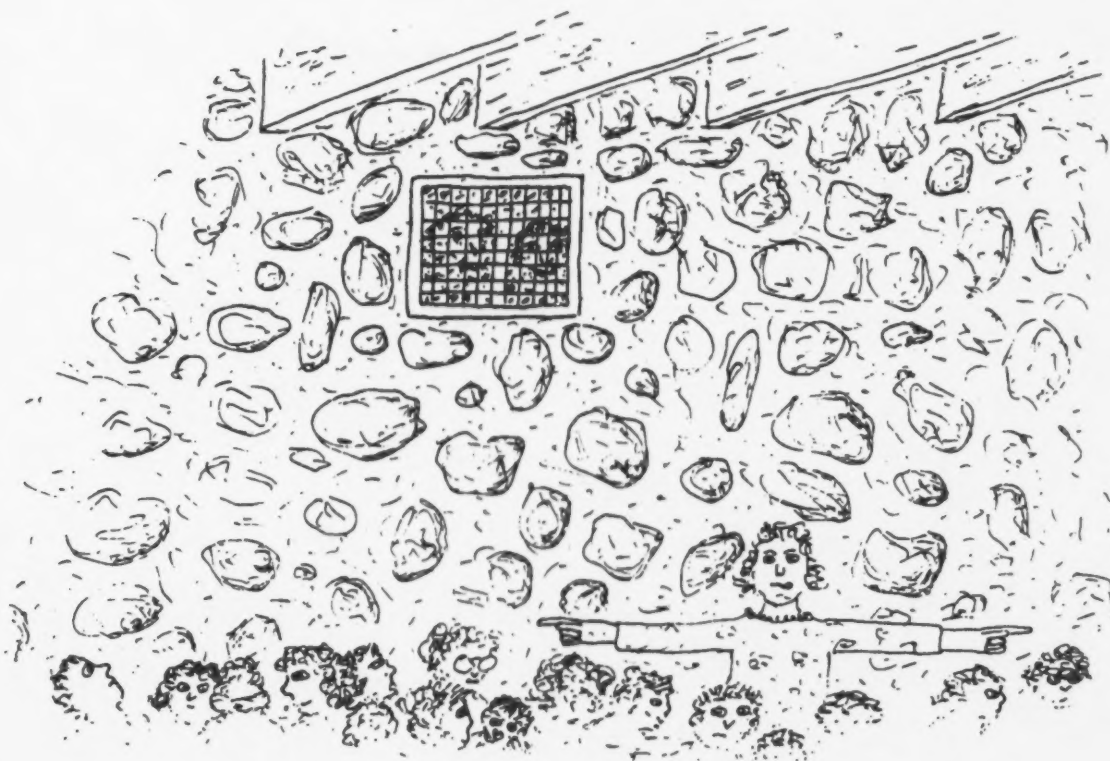
through it. But it had a little iron grating about eight feet up.

"Now I'd fooled around with brick work all my life. I said, 'Heck, we can get over in there.'

"They said, 'No, we can't.'

"I said, 'Oh, yeah?'

"So I brought a screwdriver, a hammer, and a chisel. I chiselled around that grating and lifted it out. We could get through it then. We rigged up a ladder. We'd climb through. Then we'd slip that grating back in place.



"We'd just fool around under there, whittle, wood carve, and make things. Anything was better than school. Every day one or two different boys would stay with me. We'd wait till after school was closed. Then we'd come out.

"One day, I made a mistake. I was struck on a little girl at the school. There was little windows in the cellar that opened to the outside. At noon, this little girl was setting by the window to eat her lunch. I sneaked over and pecked on the window. That was a mistake! She got me in trouble. She looked down and said, 'Elmer Marsh!'

"They hadn't seen me in the school room for a month. It wasn't long till the principal sent 25 boys down under there to look for me. We'd hear them say, 'Well, where'd they go?' They never thought about that little grating.

"They never did find us. We got by with it till we got tired of it. We thought we was smart, but we was dumb! A lot of kids would rather do anything than go to school. They got too much energy. Can't stand being closed up all day."

Holes in the Limestone Rock

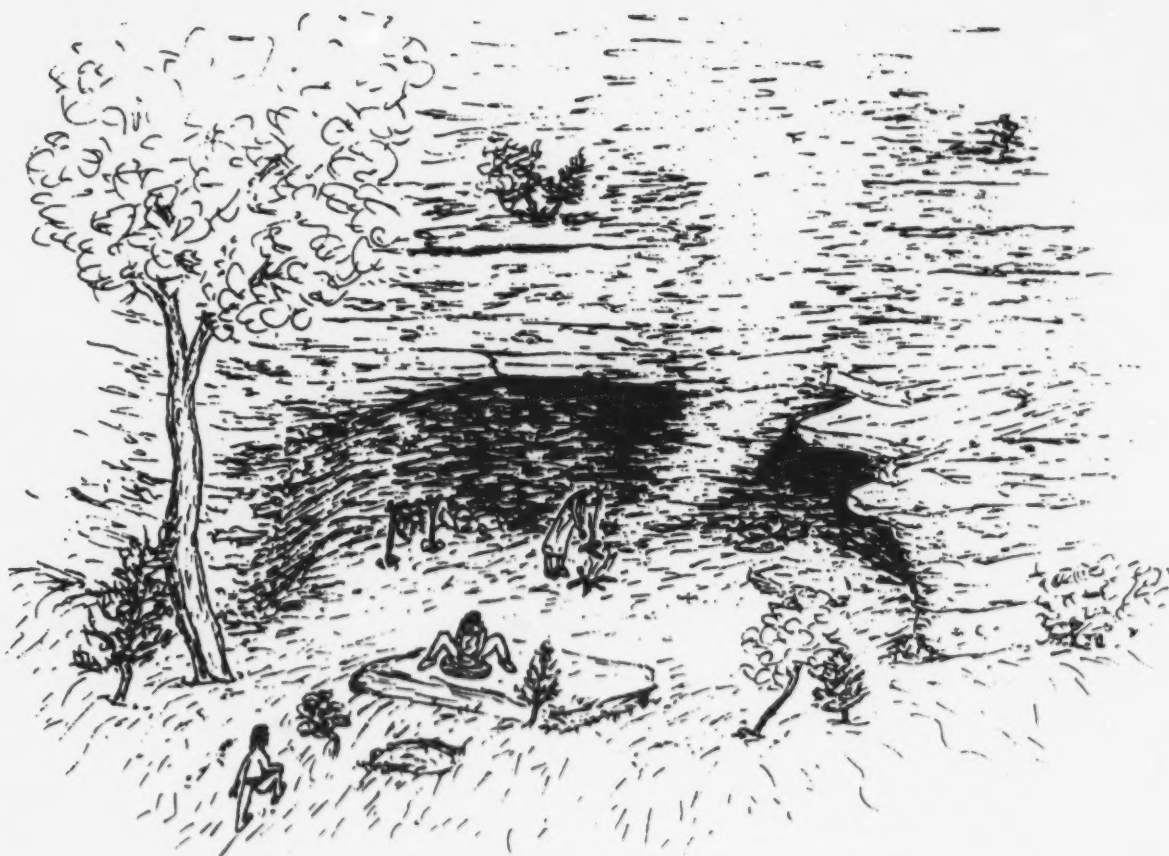
Almost anywhere you go in Tennessee, you will find gray limestone rock. Limestone was formed in shallow seas millions of years ago from lime and the skeletons of sea animals. You can still see shells in the rock.

Most gravel pits are in limestone rock. Limestone gravel is used for making concrete and for building roads.

Most of the caves in Tennessee are in limestone rock. Over many millions of years, water eats holes in the limestone deep under the ground. When these holes get big enough, they become caves. Not all caves have entrances. Sometimes a new cave is found when they dig for roads or wells.

In some caves, beautiful crystal *formations* grow from the roof or floor. These formations grow very slowly. If they are broken, they may never grow back. It is against the law to break or mark on the formations. It is also against the law to sell cave formations.

People in Tennessee have used caves for at least 9000 years. Early Indians lived in Russell Cave, near South Pittsburg, Tennessee. Scientists who study early humans have very carefully dug down in the

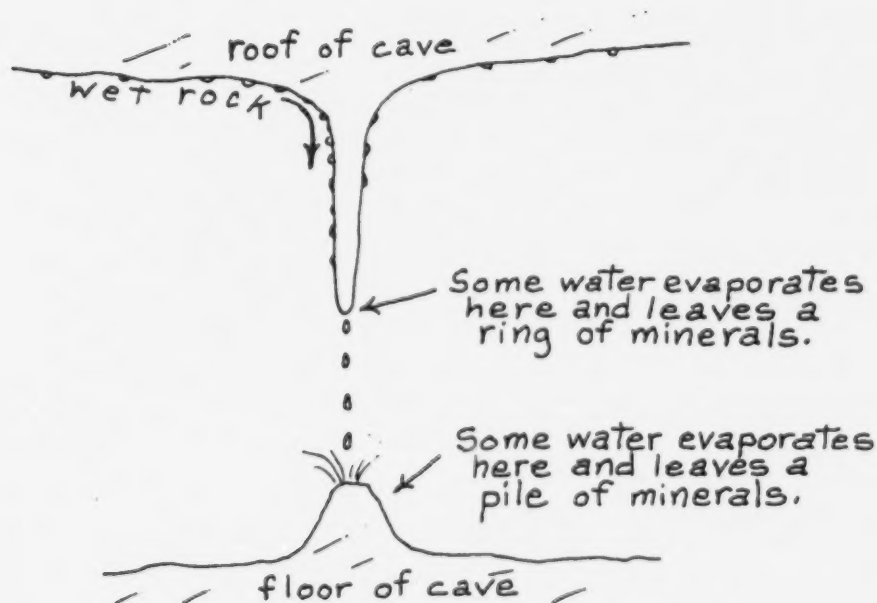


floor of this cave. They have found arrowheads, spear points, baskets, pottery, seeds, and charcoal from fires. They use tests to find out how long ago people lived in Russell Cave. Studying the baskets, pots, and arrowheads can help us to understand how these people lived 9000 years ago. This was long before the first European explorers came to Tennessee.

Information, Please

cave formation – a formation of lime in caves made from the minerals in dripping water

- **Cave formations** look like icicles. But they are solid rock. They form a lot like icicles. Water is always dripping from the roof of caves. The water has minerals in it from the rocks and soil above the cave. As the water drops hang on the ceiling, the water slowly evaporates. The water leaves behind a ring of mineral rock. This goes on for many years. The minerals become a formation shaped like an icicle. When the water drips on the floor, another formation grows up toward the roof.



Pass the Gunpowder

You wouldn't think you could get gunpowder from caves. But gunpowder is made of saltpeter (75%), charcoal (15%), and sulfur (10%). Saltpeter is also called sodium nitrate. It's used to cure hams and bacon. It can be found in the dirt in caves.

During the Civil War, the South had plenty of sulfur and charcoal. But they were short on saltpeter. So they began to mine the soil in caves.

Major Rains, of the Confederate Army, wrote a book on how to mine saltpeter. He said, "The person who makes a pound of saltpeter each day, contributes more to the success of his country (the South) than if he shouldered his musket and marched with all his sons to the battle."



The saltpeter miners first built a wooden tub or vat in the cave. They filled the vat with cave dirt. They poured water over the dirt. The water washed the saltpeter out of the dirt. They added lye or ashes to the water and saltpeter mixture. Then they boiled it. Saltpeter was left behind.

This saltpeter was not pure enough to make gunpowder. The miners sent it to a refinery. They made it pure. The refinery in Nashville could purify 5000 pounds a day.

The miners could make about 100 pounds of saltpeter from 12 barrels of cave dirt. The government paid 35 cents a pound for it. Three miners could make about \$70 a week this way. That was a lot of money in 1861.

Many caves in Tennessee were mined for saltpeter during the Civil War. Some mining equipment is still left in the caves. But people have torn up or stolen a lot of it.



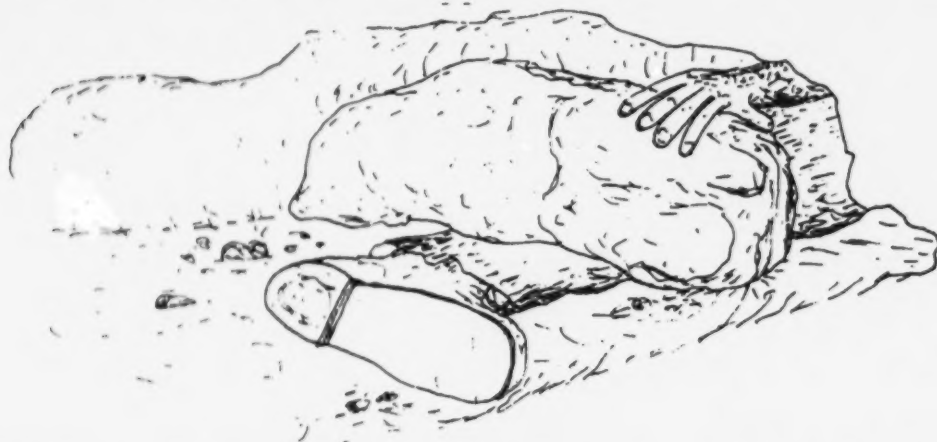
How your hand looks in a cave
without any light.

Fun and Danger in the Dark

It's always dark. It's always cold. It's damp. There's no sky and no sound but the drip of water. The only living things are bats, blind fish, and white bugs. It's muddy – or dusty. You may have to crawl flat on your belly across sharp rocks. You may have to climb down deep black holes on ropes. You may have to swim in icy water. You may get lost.

So why do people want to go in caves? Many people want to explore. They would like to travel to strange places. They want to be like Indiana Jones, or Han Solo, or Christopher Columbus, or the astronauts. It's a long way to the moon or to Africa. But most people in Tennessee live close to a strange, unexplored, dangerous place – a cave! Exploring a cave can be as exciting as a visit to Africa. It can be dangerous. There are many true stories about people who have been lost, hurt, or killed in caves.

Floyd Collins was a farmer in Kentucky. He liked to explore caves. In 1925, he was exploring a cave near his home. He got trapped in a narrow place. A



rock fell on his foot. He couldn't get out. They tried to get him out for 17 days. Newspaper reporters came from all over the U.S. The story of Floyd Collins was front page news. This was even before TV. They tried to dig a deep hole down to him. He was about 55 feet under the ground. They got the shaft down to him, but it was too late. He was dead.

This song was written by Andrew Jenkins, a blind preacher.

Floyd Collins

O come all you young people
And listen while I tell
The fate of Floyd Collins
And the hand we all knew well.

His face was fair and handsome
His heart was true and brave
His body now lies sleeping
In the lonely sandstone cave.

How sad, how sad this story
It fills our eyes with tears
The memories will linger
Through all the coming years.

A broken-hearted father
Who tried his son to save
But now leaves tears of sorrow
At the door of Floyd's cave.

Oh Mother don't you worry
Dear Father don't be sad
I'll tell you all my story
Of an awful dream I had.

I dreamed I was a prisoner
My life could not be saved
I cried, "Oh must I perish
Within this lonely cave."

The rescue party labored
They worked both night and day
To move the mighty barrier
That stood within the way.

We'll rescue Floyd Collins
This was their battle cry
He'll never, no, we'll never
Let Floyd Collins die.

But on that fateful morning
The sun rose in the sky
The workers still were busy
We'll save him by and by.

But oh how sad the ending
His life would not be saved
His body then was sleeping
In the lonely sandstone cave.

Young people all take warning
From Floyd Collins' fate
And get right with your maker
Before it is too late.

It may not be a sand cave
In which we find our tomb
But at the bar of judgement
We too must meet our due.

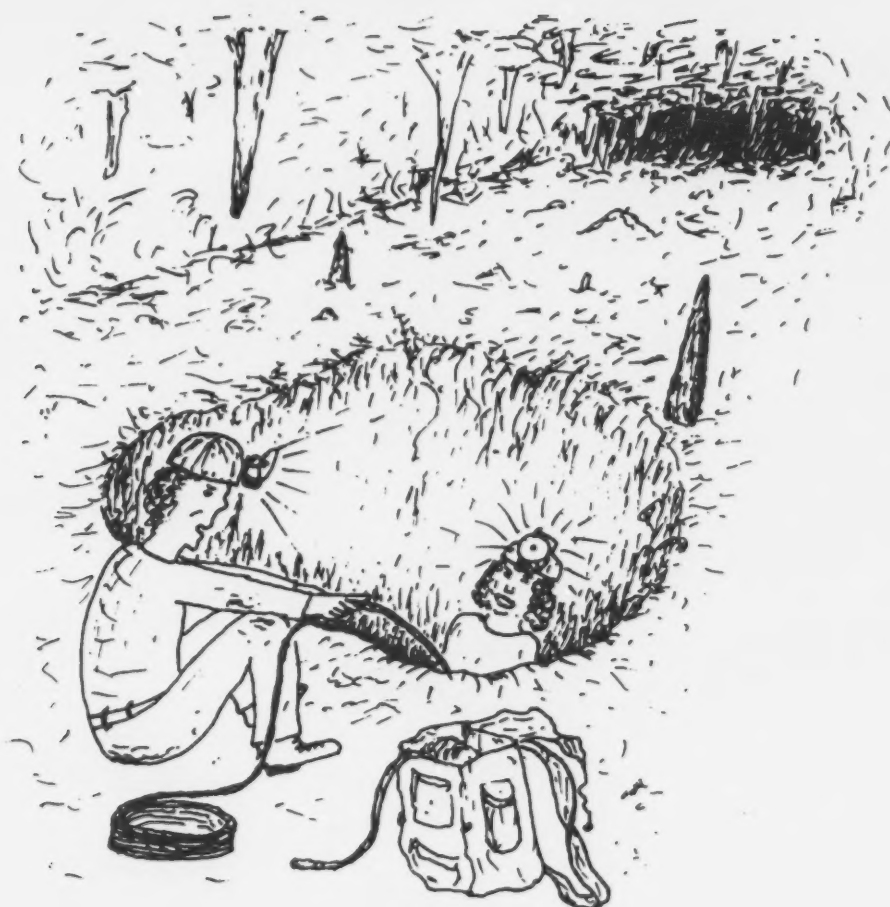
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A few people do get killed every year in caves. But caving can be safe and fun. Floyd Collins did not go by modern caving safety rules. He went alone. He didn't tell anyone where he was going. He had only one light. He didn't wear a hard hat. And people didn't know much about cave rescue then.

If you want to try caving, look for a cave near your home. If you have never been in a cave, you need to know some things.

You should first find out who owns the cave. Ask them if you can go into it. Always take someone with you. Tell someone at home where you are going. Tell them when you will be back.

Caves are completely dark. You can't see at all without a light. You need to carry four lights. You can use carbide mining lamps, flashlights, candles, or



Coleman lanterns. You should take extra batteries, carbide, and waterproof matches.

You should wear a hard hat. The ceiling may be low. It is always hard! Wear warm clothes. Caves are always about 50° and damp. People who get lost or trapped in caves can die of pneumonia because of the cold. Floyd Collins died because of the cold and damp. Take an extra coat. Take food and water. You may be in the cave longer than you planned. Don't work with ropes in the cave unless you have been trained to use them.

Take a camera with a flash. Take pictures of the cave formations. But don't touch them. Dirt will stain them. Don't break off any formations. Don't write on the walls. It will never come off. Take in a bag to carry out your garbage. Don't leave anything in the cave.

The best way to learn about caves is to go with a group of cavers. There are caving clubs in many cities. You can go on caving trips with them. They know the best caves. They have good maps. You can learn how to cave, how to use ropes, and how to map caves.

You can find out about clubs near you by writing the National Speleological Society, Cave Avenue, Huntsville, AL 35810.

A Cave Rescue

Even today, some people don't follow the rules for caving. And sometimes they get into trouble. This is a true story about two men who didn't follow the rules. The story was told by the people who rescued one of the men from a cave.

Part 1: The Cave Explorers

Joe and Bill were walking along a trail in a state park. It was a cloudy summer day. Joe stopped and said, "Isn't that a cave over there?"

Bill said, "Looks like it. Let's go see."

They walked through the woods and came up to a large opening in the rocks. A stream was running out of it. Joe said, "It looks like a big cave. Let's go in and explore it."

Bill said, "Good idea. It's going to start raining pretty soon. We can't do anything else. What about lights?"

Joe said, "I've got a couple of flashlights in my car. Let's go get them."

Joe and Bill went into the cave that day. They wore only swim trunks and tennis shoes. They took only two flashlights. They didn't know much about caves and cave exploring. They didn't know that sometimes a lot of water runs through this cave.

It had been raining for a week. The water level in the cave had been going up. After Joe and Bill went inside the cave, it started to rain again.

Joe and Bill walked along a stream in the cave. After about 30 minutes, Bill said, "This stream is getting bigger. It must be raining outside."

Suddenly, the water was up to their knees. It was flowing so fast they couldn't walk against it. Joe said, "Maybe we better get out of here!"

They turned around and started back down the stream. In the dim light of their flashlights, the rising water was scary. They got back almost to the entrance.

All they could see was water. "Oh, my God," said Joe. "We've got to get out of here."

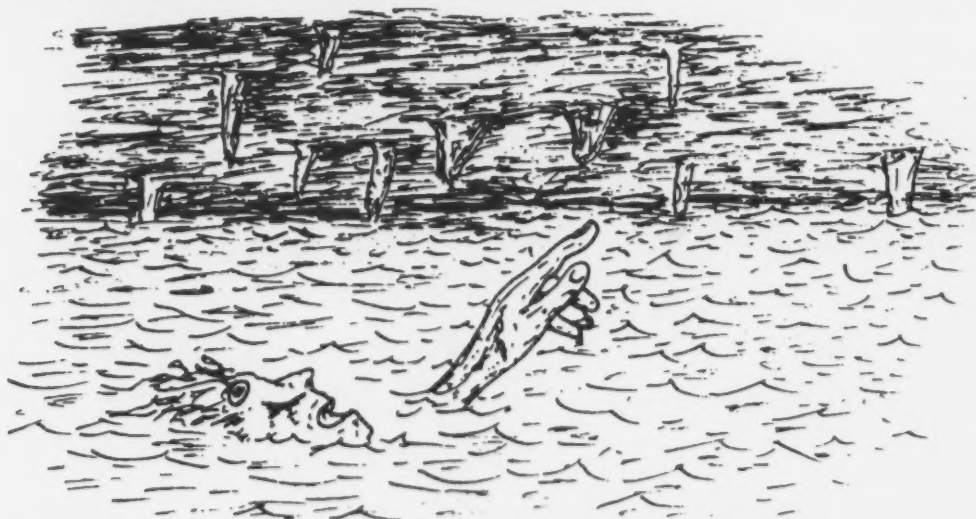
The water was now up to their waists. Bill yelled, "There's a ledge. Let's climb up on it. It's out of the water."



The ledge was close to the roof of the cave. They couldn't stand up on it. They sat there, wet and cold. Joe said, "Now what?"

The water suddenly came up almost over the ledge. Bill cried, "Help me!"

Joe looked around. Bill had fallen into the water. It was too late to grab him. Joe hung on to a rock and cried, "Bill, Bill, where are you?"



Bill was sucked down into the muddy water. It turned him over and over. He smashed into rocks. His lungs filled with water. His swim trunks and shoes were ripped off. Finally, the water carried him out the entrance.

He lay there gasping for air. Then he said, "I'm alive!" He checked himself over. He was pretty cut up, but nothing was broken. He got up and looked around. He found his trunks and one shoe.

Suddenly, he thought, "Joe's not out here. He must still be in the cave. I've got to get help. I've got to get my buddy out of there!"

Part 2: The Rescue – Heroes of the Underground

Bill found the trail and walked out to the road. He got to a phone and called the police. They called the local cave rescue group.

"Sure, we'll try to get him out," they said.

The people in the cave rescue group were all cavers. They knew how to use ropes for rescue. They had *wet suits* and boats. They even had a map of the cave.

They hiked to the entrance of the cave. Water was still pouring out the entrance. They knew they couldn't get through it. They knew about a smaller back entrance. The water flowed into it. They decided to take a raft in. But the water was too fast. It threw the little rubber raft up against the roof of the cave. The cavers were almost killed. But they were finally able to get the raft back out.

"Well, too bad. That won't work. Let's try the other entrance again," one caver said.

They climbed up to the top of the large entrance. There they found a narrow crack which went into the cave above the water. They could work their way through the crack by using ropes. They would be

hanging by the ropes above the roaring water. They would have to be very careful. If a rescuer fell into the water, he could be cut up on the rocks or even drown.

They put bolts in the sides of the crack to hold the ropes. They carefully worked their way in on the ropes. After many hours of slow and painful work, they got back as far as they could go. They were close to where Bill had fallen in.

One of the cavers went down on a rope to the top of the water. He called out over the noise of the water. He heard an answer! It was Joe. They still couldn't see him. He was around a corner of rock. Joe told them that he was still holding on to the ledge. His feet were in the water. He had his arms around a cave formation. He had been on the ledge for over two days in the dark and cold.

The rescuers could hang down near the water on their ropes and call to him. They couldn't see him. They couldn't get back to him. They put a candle, matches, and a candy bar in a baby bottle. They fastened the bottle to a long pole with tape. They tried to push the pole around the corner to him. But the water was too strong. It kept pushing the pole back.

Finally, the water started going down a little. The rescuers were able to get to Joe. He was still in pretty good shape. They put a rubber *wet suit* on him to keep him warm. They put ropes on him to carry him out. But the rescuers were now very tired. They had been working for 24 hours with no rest. They knew they were too tired to get him out. It would take hours. So they went on out of the cave on the ropes. Another group came in. This took over an hour.

Meanwhile, Joe was hanging in the cold water on the ropes. When the rescuers got back to him, he was out of his head. He was only partly conscious. Finally, they got him up into the crack above the water. There, they tied him into a rescue litter. They got him out. Bill was waiting outside.

“Boy, am I glad to see you,” cried Bill.

Joe lifted his head and tried to smile. He said, “No more caving for me!”

Joe and Bill were both strong and healthy. They lived through their caving trip. But they could have died. The rescuers could have been killed, too. Caves can be dangerous – if you don’t follow the rules.

Information, Please

wet suit – a rubber suit that divers wear to keep them warm in cold water

- She wore a **wet suit** when she went through the underwater tunnel in the cave. It kept her warm.

PART FIVE

Our Forests

Savage Gulf

I charge you to spare, perserve and cherish some portion of your primitive forests; for when these are cut away I apprehend they will not easily be replaced.

Horace Greeley, 1851

Before the first European settlers came to our valleys, only the Indians lived in Tennessee. Deep forests grew on our mountains and in our coves. The trees had never been cut. They grew tall and thick. But by the 1920's, most of the forests were gone. People cut the trees for firewood, lumber, mine timbers, railroad ties, and also to clear land for farming.

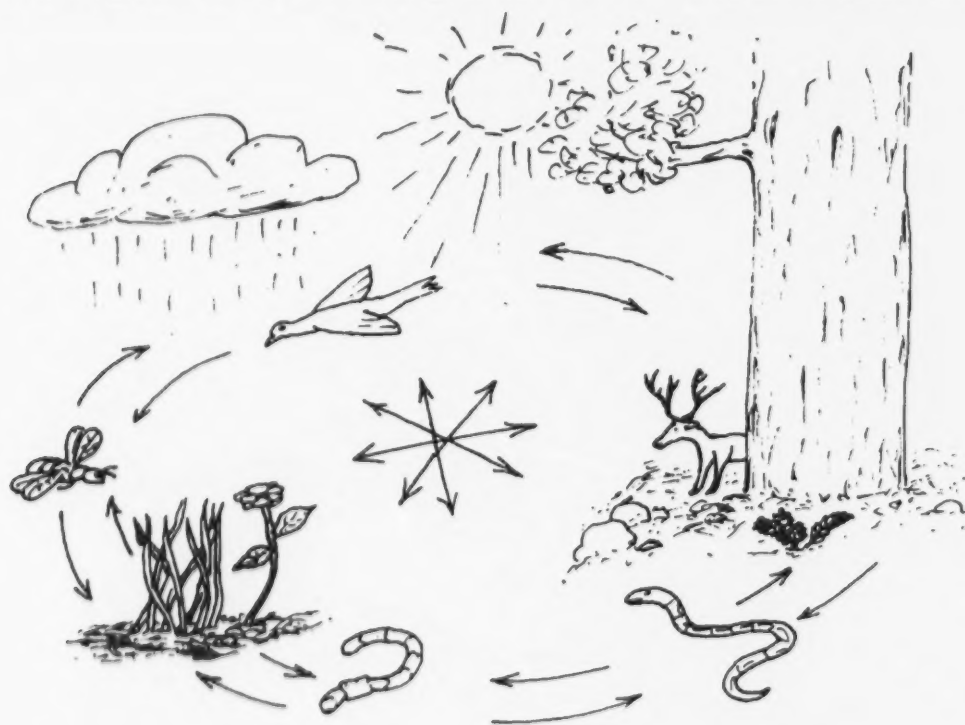
In a few places that were hard to get to, the trees were not cut. Some of these old giant trees are still growing. The uncut areas are called virgin forests.

The Great Smoky Mountains National Park has some virgin forest left. One of the only other areas of virgin forest in the eastern U.S. is near Sequatchie County.

Not many people in Tennessee know about Savage Gulf Natural Area. It is hidden in the Cumberland Mountains between Dunlap and McMinnville. The Natural Area consists of three rocky, steep-sided gulfs in Grundy County. The creeks in these gulfs join to make the Collins River. There are 70 miles of hiking trails and ten campgrounds along the rims and in the gulfs.

The forests in the gulfs and along the rim look the same as when the first settlers came to Tennessee. Because it was hard to get into the gulfs, they were never cut. The trees are the same kind that grow in all the woods of Tennessee, but they are much bigger. There are oaks, maples, hickories, yellow poplars, hemlocks, ashes, and beeches. This kind of forest is called a mixed forest. The many different trees make it very special. Scientists can study these forests and learn more about nature.

There are many different plants and animals that live together in the virgin forest. Everything in the



Arrows show how all parts of nature are connected and depend on each other.

forest depends on something else. The trees, shrubs, grasses, flowers, mosses, ferns, bugs, worms, deer, squirrels, mice, snakes, birds, frogs, and lizards all depend on each other. They also depend on the soil, rain, rocks, air, and weather.

Scientists have spent years studying the virgin forest. They are learning how the different parts of the forest depend on each other. They still have much more to learn. These forests must be left alone so scientists can keep studying them. If we cut these forests, our children will never be able to see the giant trees and learn about how nature works.

The Indians understood how all of nature is connected. Here are the words of Chief Seattle in 1854.

Teach your children what we have taught our children, that the earth is our mother.

Whatever happens to the earth happens to the sons of the earth.

If men spit upon the ground, they spit upon themselves.

This we know: The earth does not belong to man; man belongs to the earth.

This we know.

All things are connected like the blood which unites one family.

All things are connected.

Man did not weave the web of life.

He is just one thread in it.

Whatever he does to the web, he does to himself.

I have seen a thousand rotting buffaloes on the prairie, left by the white man who shot them from a passing train.

I am a savage and I do not understand how the smoking iron horse can be more important than the buffalo that we kill only to stay alive.

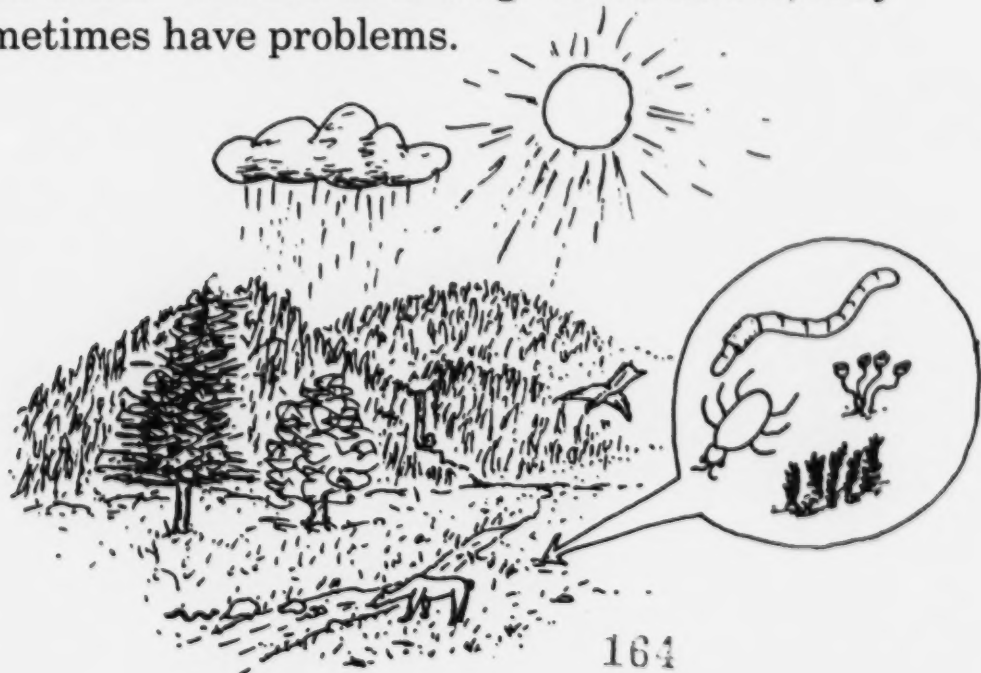
What is man without the beasts?

If all the beasts were gone, man would die from a great loneliness of spirit.

For whatever happens to the beasts, soon happens to man. All things are connected.

Tennessee is trying to save this virgin forest. The Savage Gulf Natural Area protects 12,000 acres of land. There are lots of hiking trails. The trails do not go into the steep part of Savage Gulf. The biggest trees are there. If a lot of people hiked in the Gulf, it might change the forest. Scientists want to know how the forest grows when people don't change it. People who study virgin forests can get special permits to go down into the Gulf.

Savage Gulf is very rocky and rough. There are no good trails. When scientists go down into it, they sometimes have problems.



The Gulf Keeps Its Secrets

"Well, this is it," said John, "the entrance to Savage Gulf." He backed the jeep off the dirt road. John was the man in charge of the Savage Gulf Natural Area. He was taking three people down into the Gulf. They would camp there for three days. They had been waiting for months for permission to go on this trip. No one can go into the Natural Area without a special permit.

A girl with brown hair jumped out of the jeep. "Let's go!" she said. She got her pack and put it on. Mary was a cave explorer. She had asked for a permit to map Bear Hole Cave. It had never been mapped. The entrance was at the bottom of Savage Gulf.

Jane, a tall blond girl, was already taking pictures of the trees. She was a college student. She had permission to study the different kinds and sizes of trees in the virgin forest. "Where is the trail?" she asked John.

"What trail?" laughed John.

Bill walked up, eating an apple. "Hey, it's cold! Let's get moving or we'll freeze!" Bill was a visiting forester from Colorado.

The three of them followed John. He walked quickly through the woods. Soon they came to an old moonshine still.



“Wow!” said Bill. “I’ve never seen one that big.”
There were ax cuts in the metal pan. “The revenuers
must have found this one! Wish they had left a jug
for us. They made good whiskey back then.”

They walked around the still. Suddenly they were on the edge of the Gulf. They looked down into it. Icicles hung from the bluffs. They would have to climb down those huge mossy rocks.

"It's going to be fun!" laughed Jane. They jumped and slid down the first rocky slope.

"Look at that tree!" cried Mary. It was the first of the giant trees of the Gulf.

"What kind is it?" asked Jane. They walked over to it. They all knew the trees of Tennessee. But they had never seen one so big. The bark was thick. It was hard to see the first branches. They were far above the ground.

"It's a yellow poplar," said John. "You'll learn to recognize the big ones soon."

"Oh, boy! What a beauty," said Jane. "Let's get going. I want to measure some of the trees." They began to climb down the rocks again.

"This is the easy way down," said John. He pointed to the high bluffs on both sides of them. "We would never get down those bluffs – or back up!" A waterfall splashed down. The rocks were covered with ice. Giant icicles hung from them. Every few minutes someone stopped to take a picture or measure a tree.

"This hemlock is ten feet around!" shouted Jane.

"Oh, come on," said Mary. "We'll never get to the bottom." Mary wasn't interested in the trees. She wanted to get to the cave. She planned to spend two days mapping it.

They planned to sleep in the cave. The temperature outside would drop below freezing that night. But it would be warmer in the cave.

"How much farther is it?" Bill asked John.

"We're about halfway down," said John. "The gulf is around 800 feet deep here. You'll see bigger trees soon."

They could recognize most of the trees now. They had seen giant hemlocks, poplars, hickories, and ashes. They measured the bigger ones.

"This one's 13 feet around. That's over four feet across," said Jane. The bark had cracks deeper than her hand.

Finally, they got down to Savage Creek. They dropped their packs. All of them fell to the ground to rest by a huge spring of icy water.

"That was some hike," said Bill. He pulled out a sandwich.

"And we have to go back up it!" cried Mary.

"You mean they aren't going to send a helicopter to get us?" joked Bill.

"I'm afraid not," laughed John.



Jane was already running up and down the creek. She was looking for bigger trees. "Come and bring the tape," she called. "This one's a monster."

They dragged their tired bodies up to the giant hickory. "Jane, don't you ever get tired?" asked Bill as he opened a candy bar.

"Oh, hurry up!" she said. "Don't you ever stop eating?"

"It's 20 feet around," said Mary. "That's the biggest yet. Here, let's hold hands and see if we can reach around it." The four of them could barely touch fingers.

"Let's get across the creek. I want to see the cave opening," said Mary.

"I think we can cross up a ways," said John. The creek was roaring and muddy. They walked to a wide shallow place. Rocks showed above the icy water.

"It won't be easy!" Mary said. "I'll go first and take my rope. I'll tie it on the other side. You all can hold on to it. That'll help." Mary jumped from rock to rock. She was almost across when she hit an icy spot. Her foot slipped into the water. "Oh, damn!" she said. The others laughed. She sat down on the other side and poured the water out of her boot.

"All right, if it's so funny, you try it!" she yelled. She tied her end of the rope to a tree. The others started across. Jane and Bill made it safely.

John came last. Halfway across, he stepped on a

wet mossy rock. His foot went into the water. The others started to laugh. But the water was deep and fast where he slipped. It knocked him down across some rocks. He cried out in pain.

"Hold on!" shouted Mary. She took off across the water with only one boot on.

"I'm OK," said John. He tried to get out of the water. But he fell back in. "I'm afraid I've hurt my leg," he said.

Mary grabbed his arm. "Try to stand on your good leg," she said. She pulled him up. They were standing in three feet of roaring water. Bill got to them. He took John's other arm. They walked through the water, half-carrying John. They laid him down on the dry sand. His face was white with pain.

"I hope it's not broken," he whispered.

They took off his wet clothes. They covered him with a sleeping bag. Mary pulled a first-aid kit out of her pack. She looked at John's leg. It was blue and swelling. "It's not too bad, but it's broken," she said. "I'll put a splint on it." She blew up a plastic splint. She taped it to his leg.

"We've got to get you out of here," she said. "We can't carry you."

He moaned. "I'm afraid you're right. One of you

will have to go back up. Call the ranger station from the CB in the jeep. They'll send help."

Bill and Jane looked at each other. Mary knew first aid. She would have to stay with John. "Let's flip for it," said Bill. He pulled out a coin. "Call it," he said.

"Heads," replied Jane.

"And it's tails. So I go," said Bill. He pulled some dry socks and pants out of his pack. "I won't put these on till I get across," he laughed.

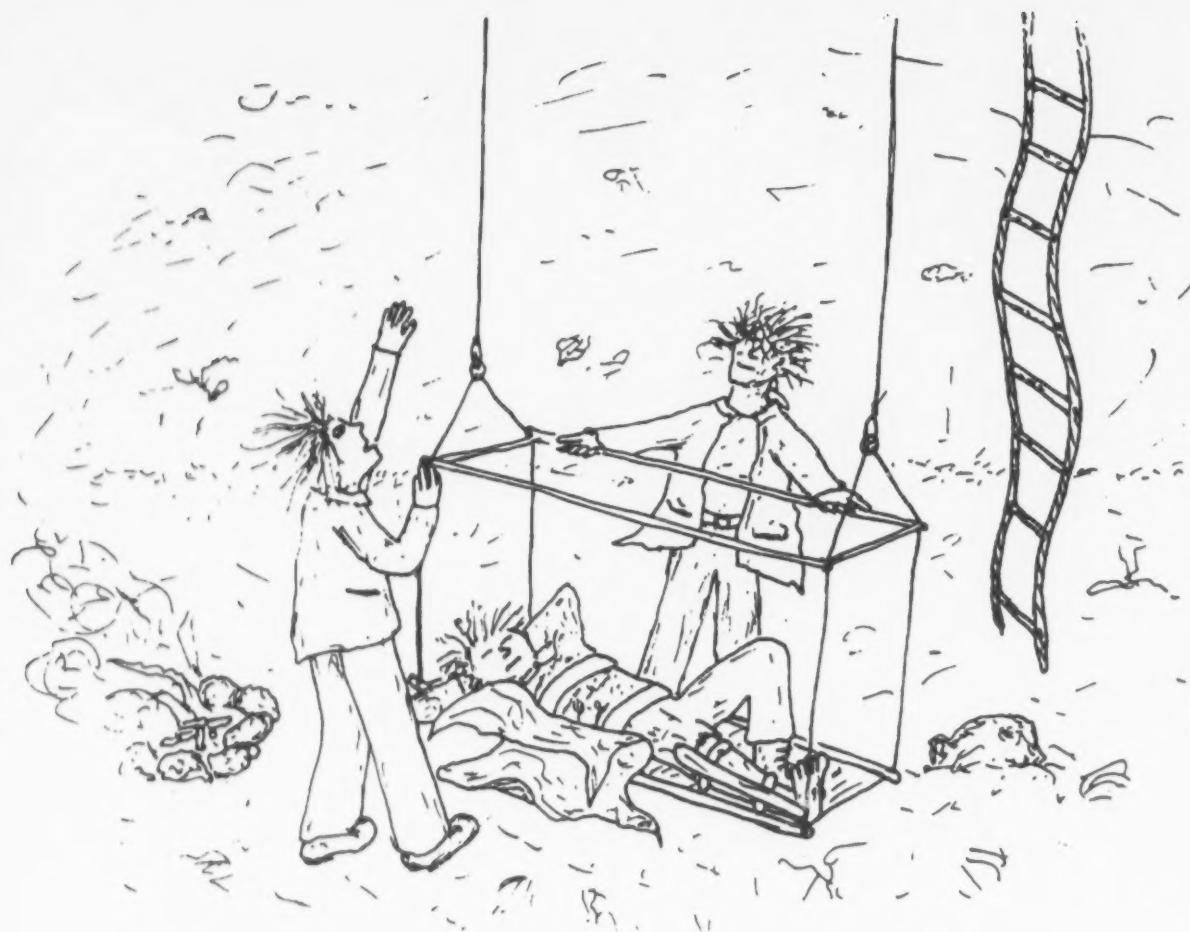
Mary and Jane watched until Bill was out of sight in the giant trees. John was shaking with cold. The girls looked at each other. Both knew he was in shock. It could be bad.

Jane said, "I'll build a fire. Put the other sleeping bag on him."

They waited for hours by the fire. It was almost dark when Mary said, "Listen!" They both heard the flup-flup-flup of a helicopter. Suddenly they saw lights above them. They jumped up and down and waved.

A rope with a stretcher dropped by them. They strapped John to the stretcher. He was slowly pulled up to the helicopter. Another rope dropped down. The pilot yelled to them. Mary and Jane looked at each other. They didn't want to go.

"I guess we have to go," said Mary.



"Well, maybe we can come back another time," said Jane.

They tied the packs on the rope and waited. Finally, the rope came down again. Jane grabbed it and climbed up to the helicopter. "Are you OK?" she asked John.

"I'm fine!" he said. "Where's Mary?"

"I'm right here," she said as she climbed in. "This is some trip!"

"Well, I guess Bill was right," said Jane. "He said we'd go out by 'copter!"

The Use of Trees

Born on a mountain top in Tennessee
Greenest state in the land of the free

From Davy Crockett

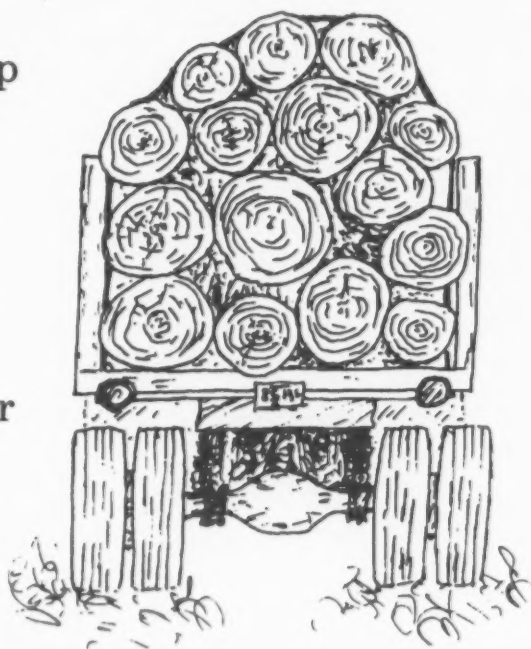
Words by Tom Blackburn

Tennessee is the greenest state because of her many acres of forests. Although most of the virgin forests had been cut by the 1920's, many trees have been replanted or have grown back.

The trees are still being cut. The paper mills cut many thousands of acres of pines every year. But they replant them.

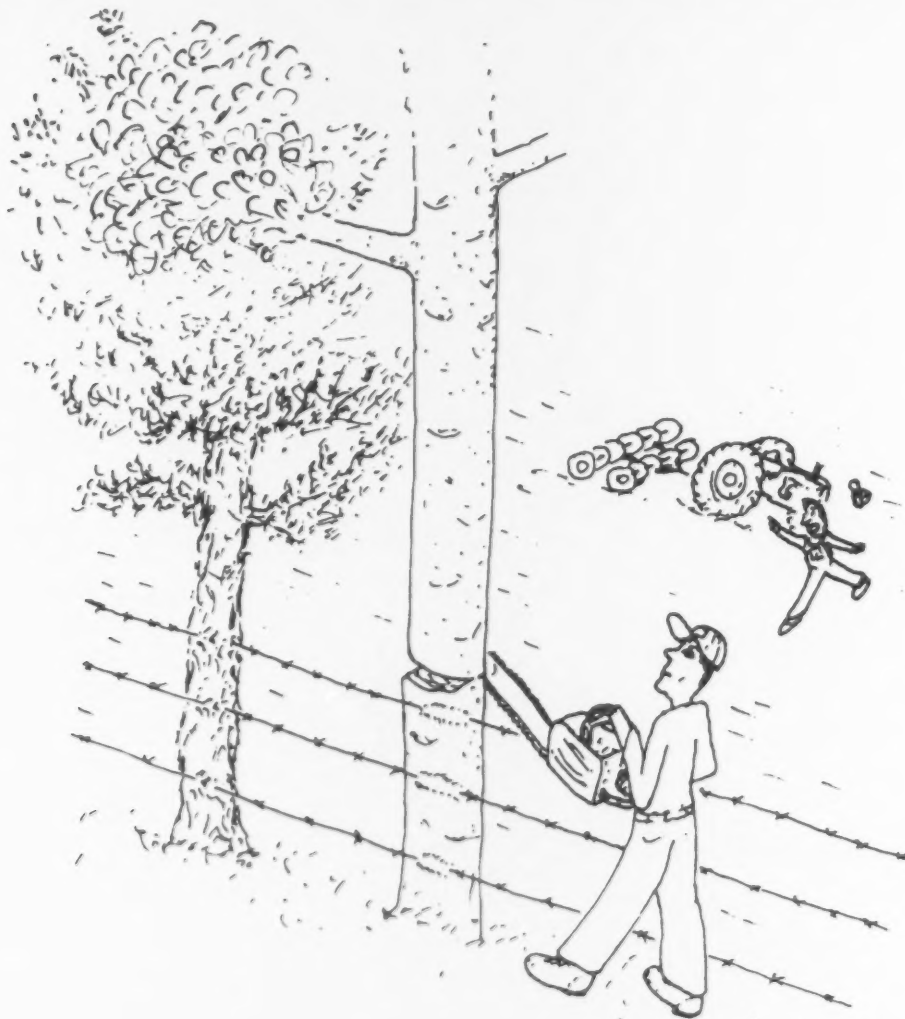
Farmland that is too steep to plow can be planted in pines. In about 20 years, the pines can be sold for pulpwood to make paper.

The oaks and other hardwood trees are cut for railroad crossties and lumber. The best wood is used for furniture and flooring. Hickory is used for making handles and charcoal. Trees that are not good enough for lumber are cut for firewood. A lot of people in Tennessee like to cut their own firewood.



Some people plant black walnuts. It's 40 years before they can be sold. But a full-grown black walnut is worth a lot of money. It's one of the most expensive woods grown in the U.S.

An interesting tree that grows very fast and has valuable wood is the princess tree, or *Paulownia*. It has beautiful purple blooms and brown seed pods. The seed pods hang on all winter. It was brought to



the U.S. from China about 80 years ago because of its beauty. It now grows along roads and in fence rows all over Tennessee. In fact, it grows like a weed.

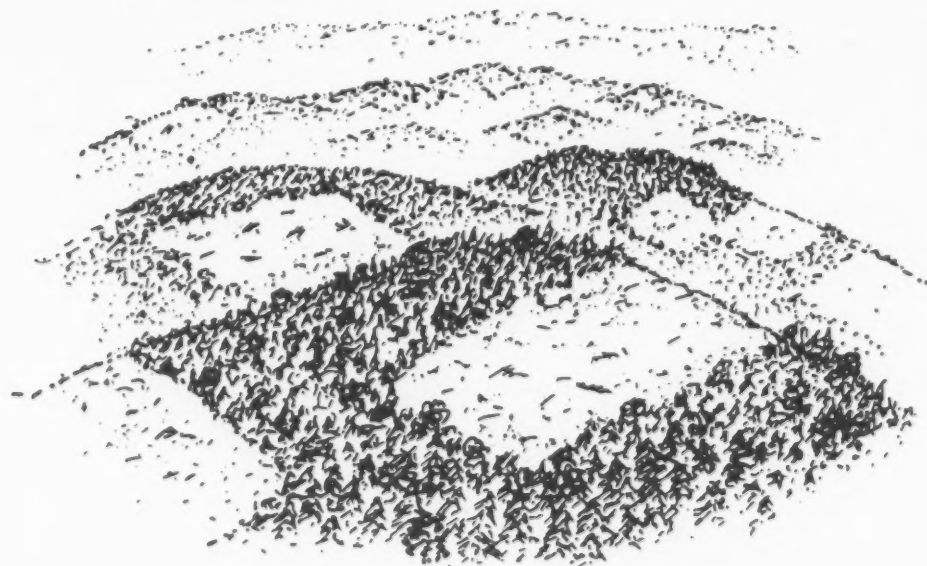
In Japan, *Paulownia* wood is very expensive. It is used for making special kinds of furniture and for making wooden slippers. The Japanese didn't know the tree was growing all over Tennessee until about 1972. When they found out, they started buying the wood. They were willing to pay a lot for it. People started cutting the trees on roadsides and stealing them out of farmers' fence rows. After a few years, most of the bigger ones were cut and the price dropped.

Paper From Trees

Paper may not seem like a very important part of life. But could we live without it? Every person in the U.S. uses about 500 pounds of paper a year.

Paper was invented over 2000 years ago. Until the 1800's, it was slow and expensive to make. It was made mostly from old rags. There weren't many books. They cost a lot. Then people found out a cheap and easy way to make paper from trees. Soon, everyone was using paper. For the first time, everyone could buy and read newspapers and books.

Many people in Tennessee have jobs because of paper making. People work to plant the trees, take care of the growing forests, prevent fires, cut the trees, and haul them. The paper mills hire many more workers.



It takes millions of trees every year to make paper. Many of these trees are grown in Tennessee. Most pulpwood for paper making comes from pines. The paper companies plant thousands of acres of pines. They can be cut in 15 to 35 years for pulpwood. A 20 year old pine tree can make 3,600 grocery bags.

These pine forests are taking the place of our natural mixed forests in Tennessee. Oaks, beeches, hickories, pines, maples, and more grow in mixed forests. An acre of mixed forest in Tennessee may have 100 different kinds of trees and bushes growing on it. There are not many places in the world that have so many different trees per acre. A pure pine forest will only have a few kinds of plants growing in it. Also, a forest of pines doesn't have as many different animals in it as a mixed forest does. It just doesn't produce as much food. But pine forests are better than no forests at all.

Paper companies try to produce as much wood as possible on every acre, so they take good care of their forests. When they plant pines, they leave some mixed forests. Some areas are planted for wildlife. Trails, picnic areas, campsites, and hunting help people enjoy the pulpwood forests.

Paper mills are large. They cost a lot of money to build and run. But they can make paper cheaply and

quickly. They can also cause problems. The chemicals used to make paper can pollute the air, water, and land. The paper mills have been causing less pollution lately. They are trying to keep the water, air, and land near the mills cleaner.

Although more and more paper will be needed in the future, we can hope that our mixed forests will not all be cut down and replaced with pines. New ways of making paper and using waste wood and old paper can help. Paper can be made from oat straw and from plants like kenaf and hemp instead of trees. These plants can be grown on farms like hay or corn.

A lot of paper is now recycled. That means that old paper is made into new paper. About a fourth of the paper we use has been recycled.

Today, people don't throw paper in the garbage. They take it to the recycling center. People also try harder to use less paper. They used to just burn the sawdust, slabs, and scrap wood at the sawmills. Now they chip the scrap up and make paper with it. The sawdust is used in chicken houses as litter or burned for energy at the paper mill. The bark is sold to gardeners to put around shrubs.

Our forests bring millions of tourists to Tennessee every year. They make our land beautiful. They keep

the rain from washing away the soil. They give the animals a place to live. Every kind of tree is important.

In the old days, people thought they could never cut down all the forests in Tennessee. They didn't think trees were worth anything. Farmers had to cut the trees so they could plant crops. They burned the woods every year so more grass would grow. Today, people in Tennessee are more careful about fires. They know how valuable trees are. They take care of the forests. They plant trees to stop erosion, to cover old mine dumps, to make jobs, and because they are beautiful.

Pines, walnuts, oaks, hickories, poplars, maples, dogwoods—they give us more than money and jobs. They give us cool green hills, wild animals, clear creeks, birds, hunting, hiking, and beauty. We need to keep that beauty for our children.

When the Mountains Burned

Charlie Clark was one of the first forest rangers in the Sequatchie Valley. He worked for the Forest Service from 1927 until 1960.

Charlie: "People back then would run cattle on the free range. They'd burn the woods so the grass would grow better. People here in the valley would just go up there on their horses. They'd stick a match to the woods. Then they'd get gone. They wouldn't stick around. They didn't care if they burned up a house or what just as long as they got their pasture. People would take their cattle in for free pasture after they'd burned it. Well, some of us was against that. They'd have fire all over this ridge here and that mountain over there. I didn't like it myself. I didn't like to see fire in the woods.

"So I wrote a letter to the State Forester in Nashville. I told him they was burning up all the woods back in here. There was a law against it then. But we didn't have no fire patrol or protection whatsoever.

"He wrote right back to me. Asked if I didn't want a job with them! So I signed on.

"First fire I had to fight was on Christmas night, 1927. I got the tools from a man up in Pikeville. He worked for the Forest Service, but he was sort of a

lazy man and a fox hunter. The Forest Service didn't pay much. So he didn't fool with no fires. When I got the job, he brought his tools down and give them to me.

"I had one boy, Victor, who volunteered to go with me. I was only getting 25 cents an hour myself. I said, 'Victor, if you'll go with me, I'll give you half what I get.' So he said all right, he'd go. So he went along with me.

"We worked two or three hours and came back home. We used those fire rakes and raked the leaves in front of the fire. Later on we had five-gallon pack pumps of water to spray on the fire. After that,



when that was old stuff, the State got fire plows. That was sometime in the 30's. They'd go along and plow in front of the fire.

"I was the leader. I had to teach the others how. Had to show them where to go. I'd go along in front of my crew. They'd say, 'How in the world do you beat us to the fire every time?'"

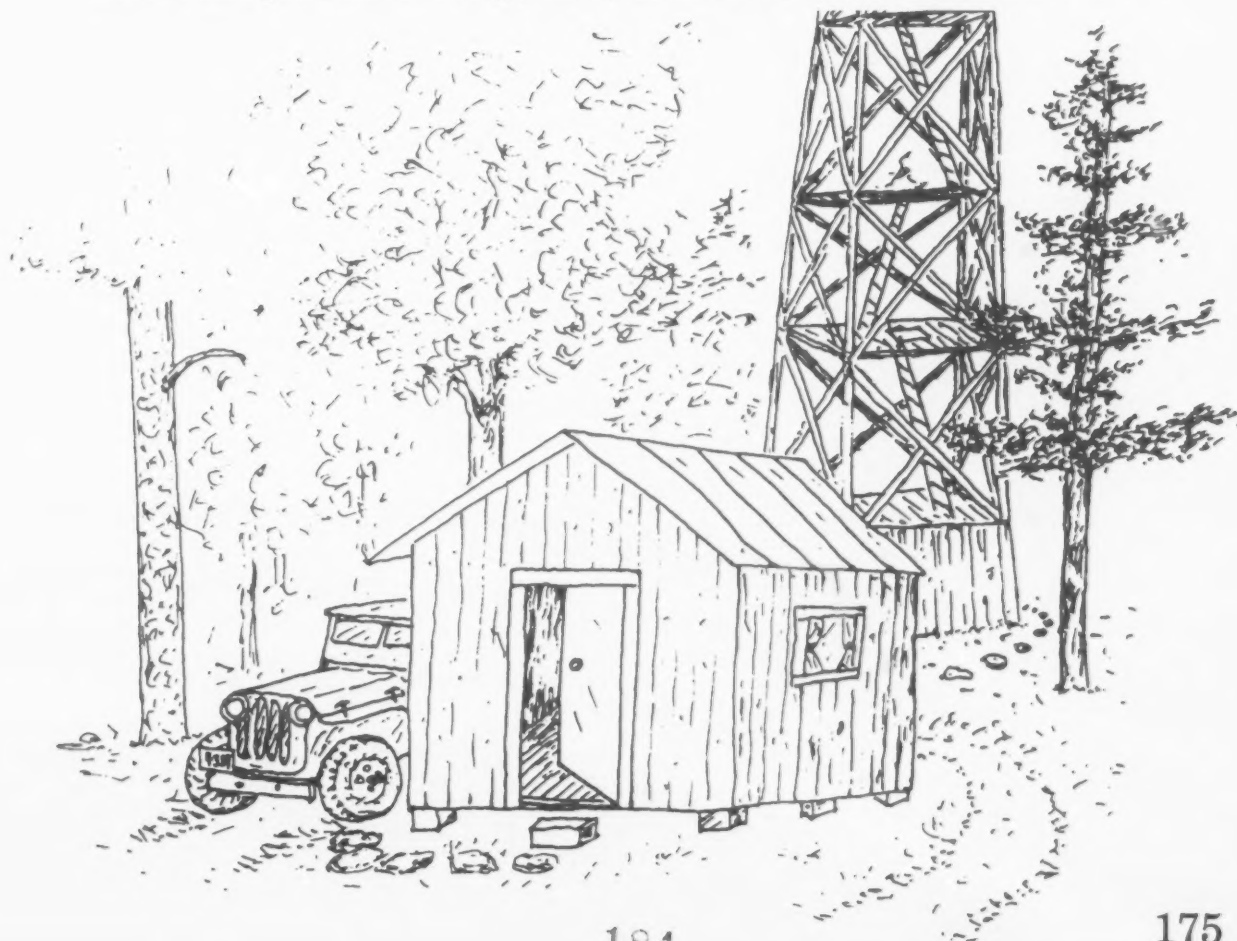
"I'd say, 'I'm just a good walker.' I'd beat them to the top of the mountain. I'd been used to climbing mountains. They wasn't. I'd go right up that mountain. Have a lot of that fire put out before they got up there. Did it for years, till they got the plows. Then none of us had much to do. Still had to have crews.

"I worked in nine counties around here. Had charge of two counties at a time. They'd have watchmen on all the fire towers all the time.

"The first fire tower in Tennessee was on Jake's Mountain in Sequatchie County. When the old wooden towers went out of style, they tore that one down. Me and my crew had to put up a new steel tower 80 feet high. Poor old boy that helped me is dead now. Just him and me was the only ones that put the top on that tower. We had to get up on that 80-foot high tower and build a cabin and put a top on it. A lot of times the other boys would be afraid to get

up on the tower. I'd have to paint the roof myself. I'd put a rope around the top of the tower and then around my body. I'd just lay there and paint it, with my feet hanging off! You can see I had a little nerve once! (He laughs.)

"Lots of times we had girls on the towers. The man would be in the crew. The wife would be at home. So she'd stay up in the lookout in the day. There'd be a cabin down at the base of the tower. They'd live in that. I talked to the girl on the tower in Pikeville many a time. I'd ask her how everything was. Maybe she'd say, 'Oh, there's a little smoke



down here. Might be someone making whiskey.' I'd go look.

"Oh, those people making whiskey would come help me on the fires. We wouldn't tell on a man making whiskey. One of my lookouts said one day, 'Look what a smoke down yonder!' I knew what it was down there!

"One time a little boy living by the tower said, 'I've never seen a still. I'd love to see one.'

"I said, 'Well, if you see a smoke down there, we'll go down.' So one day he come and got me. I knowed what he wanted. We started down the hill. Down under the bluff we came on a whiskey still as big as this room. Big ol' furnace. I just looked around and said, 'Boy, you be careful!' I turned around and went back up the hill. I never reported it.

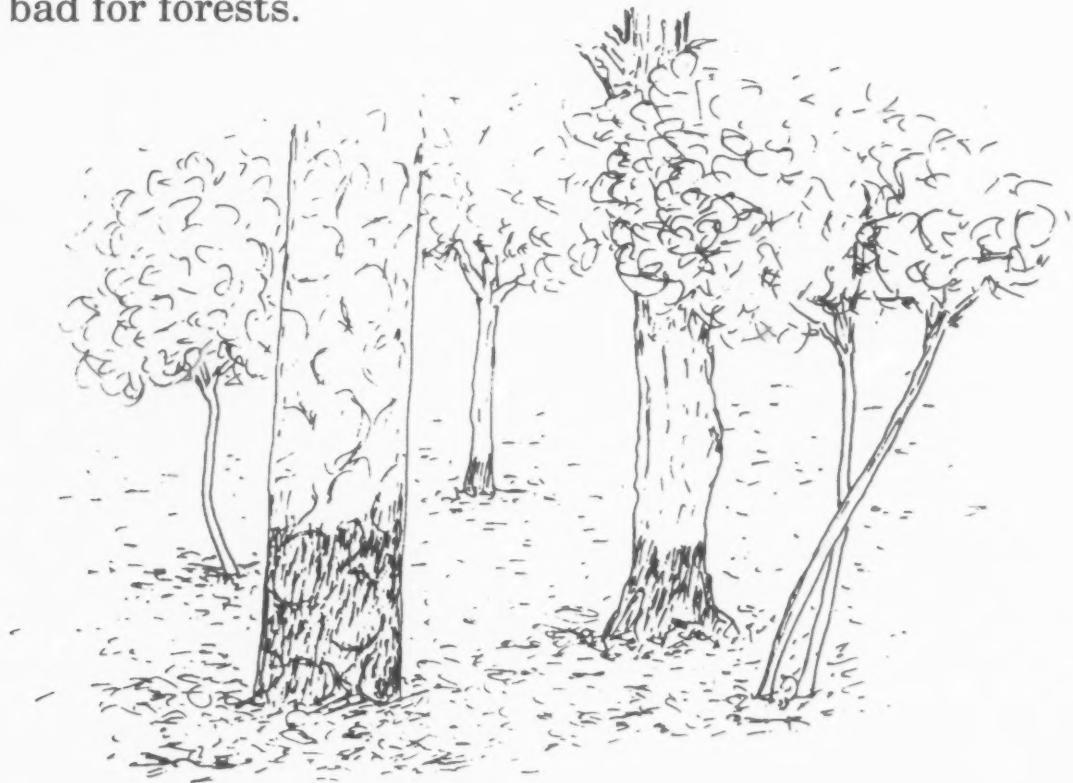
"Had those old-time ground telephones. We strung the wires in the trees. We had four lines coming in here to our house from the towers. They'd call me whenever they saw a fire. Then I would get hold of my crew leaders.

"They finally stopped burning the mountains after the State got a law against it. So every year, my job got lighter."

Wildfires Today

In the last 25 years, almost a million acres of forest have burned in Tennessee. And almost all of the fires were caused by people. Most are accidents. People forget how easy it is for a large brush or grass fire to suddenly spread into the woods.

Some people still think that fires are good for the woods. They say it kills snakes and helps the grass to grow. But most people today know that fires are bad for forests.



There was a ground fire here
several years ago.

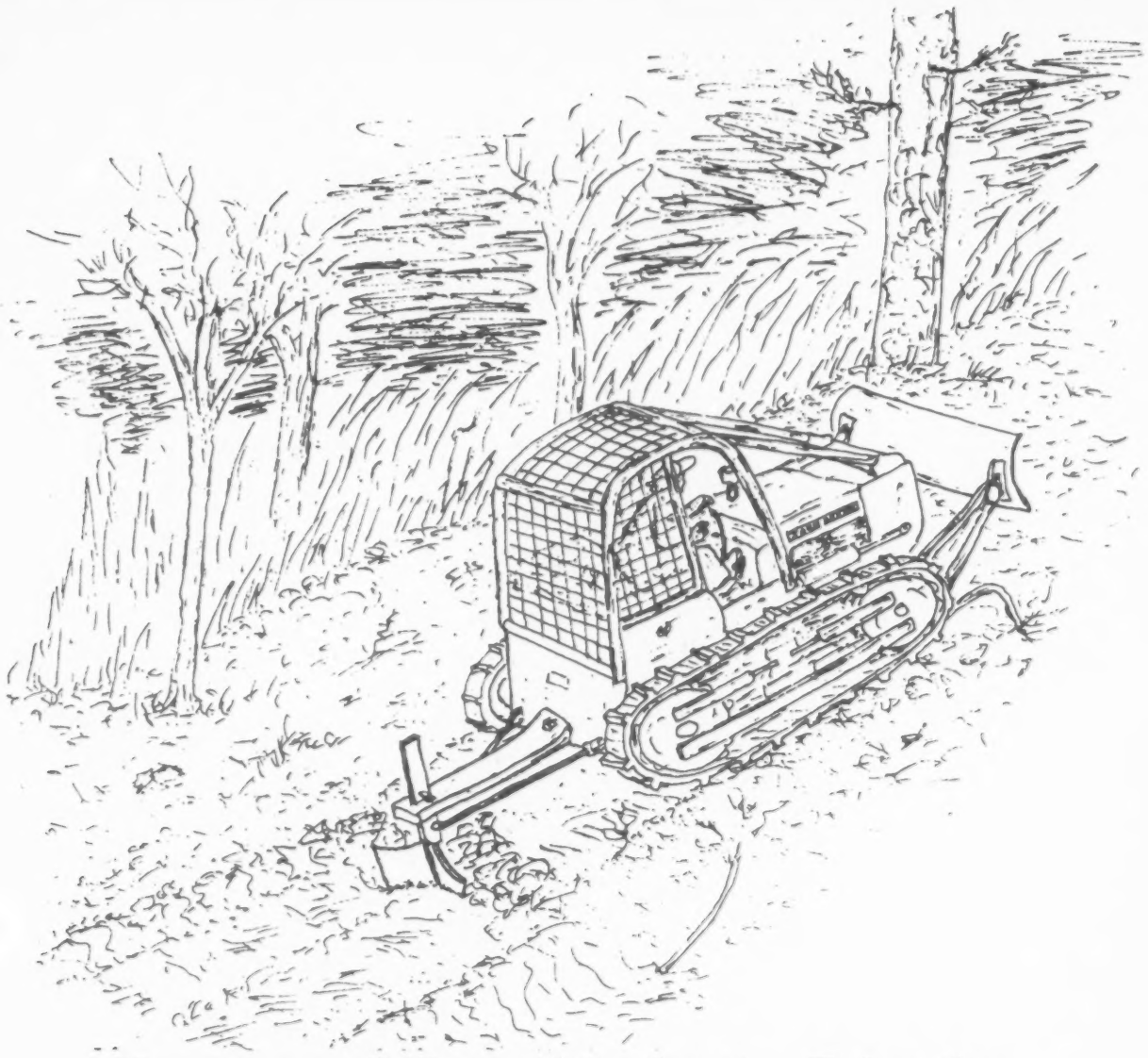
Most fires in Tennessee are ground fires. They burn mainly the leaves on the ground. They can kill small trees and seedlings. The fire may burn through the bark at the base of the trees. Then disease or insects can get into the trees and kill them. Five years after a fire you will see some trees just starting to die.

Since a fire burns off all the leaves on the ground, the rain can cause erosion (wash away the soil). The mud washes into streams and may kill fish. Wildfires also kill the wild animals of the forest, burn their homes, and destroy their food.

If the weather is very dry and the wind is blowing, the fire may climb to the tops of the trees. This is called a crown fire. A crown fire can destroy lots of timber. They are also very dangerous to fight.

A burned forest is not a beautiful thing to see. No one wants to hike through a burned forest. The trees can be replanted. But it will take many years for the forest to return.

The fire danger is highest in Tennessee from February to April. That's when the ground is covered with dry leaves and the wind blows. Be careful with fires. Don't burn brush when the fire danger is high or if the wind is blowing. Never leave a brush fire. Have rakes ready in case it gets out of control.



If you see a wildfire, call the forester. Today, they fight forest fires in Tennessee about the same way Charlie Clark did. They use heavy rakes to clear the leaves in front of the fire. Most ground fires won't jump across a cleared space. In large fires, a small tractor pulls a plow ahead of the fire. It makes a ditch. The ditch and plowed dirt will stop most fires.

If your woodland is burned, the forester can help you replant trees.

PART SIX

Herbs and Healing

Mountain Medicine

In the old days, the people of the mountains lived far from hospitals. They didn't have doctors or drugstores. When they needed medicine, they went to the woods and fields. They used roots, leaves, seeds, and bark. Some people learned about the use of herbs from the Indians. Others learned from their parents. Sometimes they learned by just trying things out.

Charlie Clark learned about herbs from reading books and working in the woods. He is 90 years old. He has had a stroke. He is in a wheel chair. But he still knows his herbs.

Charlie: "I was born and raised right here in the valley. I know all this country up and down. I've studied herbs all my life. I've been out in the woods since I was big enough. I worked 31 years in the Forest Service. Every chance I've had, I've looked for herbs. I know lots of herbs. Lots of herbs!"

"I like to see people interested in herbs. The Lord put them in the world for us to use. Everything a body needs is there. Now I don't mean to interfere with druggists. But a person could live to a hundred if they'd just learn the herbs. I wish I could take you to the woods and show you. Up on the mountain you get all kinds of herbs. Now if some careless

fellow gets in there with fire, it's hard for the herbs to come back. Might near kills them out.

"I'll tell you one of the best remedies we've got for ailing kidneys. That's bearsfoot, queen of the meadow, and seven bark. Queen of the meadow has a big pink blossom. Seven bark is hydrangea. It grows along the little branches. Bearsfoot grows out by my garage. It has a root as big as my finger. You've got to mix them. It takes several herbs to make a dose of medicine.

"There's giant Solomon seal on the bank out there. They cut it down when I had my stroke. It's come back now. It has a great long root. It's white as snow. You chew it. The juice is good for your stomach. Good for the kidneys, too. Most everybody has trouble with their kidneys when they get older. Well, that keeps you shaped up.

"Aloe vera will grow in the house in a pot. The juice is good for scratches, burns, and cuts.

"Goldenseal is good for the blood. It's as bitter as quinine. Rat's vein and burdock are good blood medicines also.

"After you collect your herbs, you dry them in the shade. Then you crumble them into a fine powder. Put a teaspoon of the powder in boiling water. You get all the strength out of it that way."

Mae McDowell remembers these remedies.

Mae: "We used to make tea from wild cherry bark and mullein leaves for coughs. Boil it and add sugar or honey.

"If someone was coming down with a cold or flu, we'd make them some rat's vein tea. They'd drink that at night. It'd sweat them.

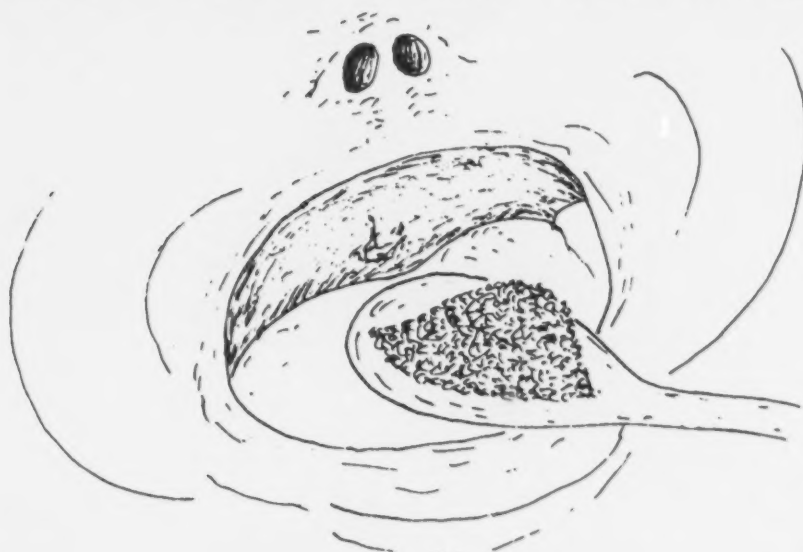
"A home remedy I learned 25 years ago said to take a teaspoon of baking soda and add enough castor oil to make it soft. Take that for diarrhea. It'll just about cure you. I've tried it. It works."

Johnnie and Ines Tucker are sisters. They live in Pikeville. They are in their 60's. They take care of their mother who is very old and needs constant care. They love to talk about life in the old days.

Their grandmother was quite a woman. Her husband died young and left her with six children. She and the children worked together on their farm in Keedy Cove. They made a good living for that time. They lived in a beautiful log cabin with two large fireplaces. White roses bloomed over the parlor windows. The furniture was homemade or bought from mail order stores. She was a fine seamstress and cook. She also knew how to find and use herbs to raise a healthy family. Johnnie said, "It just makes you want to go back and live that way again!"

Johnnie and Ines: "Our grandmother didn't have a name for it. It was just her salve. It was made of balm of Gilead buds, heartleaf, rat's vein, and mutton tallow. She cooked them all together. When it got waxy, she poured it into little jars. It made a good salve when it set. That salve would heal anything: cuts, rashes, whatever. You'd just smooth it on and tie it up with a clean white cloth. In two or three days it'd be well.

"They would put a drop of turpentine in a spoon of sugar and give it to babies with the croup.



"People back then had to make do with whatever they had. They used onion poultices for coughs and chest troubles. They cooked the onions in pure hog lard and spread them out on a cloth. They put another cloth on top and put that on the chest hot.

Then they put hot cloths on top of it. That's a poultice. It would break up the congestion.

"There was another thing my grandmother would do for her children. She would get a little lump of asafetida and put it in a little bag. She tied a string on the bag and put it around the children's necks. They wore that to school all winter long. Other kids would have colds but her kids didn't. It worked! Shew! Smells so bad, it should! They bought asafetida at the drug store. You can still get it. It comes in little cakes. I have some in there now. Garlic works the same way.

"For coughs she used honey or rock candy and moonshine whiskey. She kept a bottle of it in her cabinet. When they got a cough they'd just take a swig of it. It would cut it loose. Back then moonshine was made in copper stills. They made it right. It was perfectly safe. You better lay off what they make today!

"Red puccoon (bloodroot) was good for chickens. It has a pretty white flower and a red root. My grandmother would mash it up and put water on it. She'd give that red water to the chickens. It kept the chickens so healthy. It kept the mites off, too.

"The roots of sassafras make good tea. You wash the root and cut it up. Then you simmer it. We dug



scurvey roots for cleaning our teeth. It made a good toothbrush.

“Spicewood grows along branches. Mama would send us after it. We’d get the limbs. She’d break them into little pieces. Then she’d pour hot water over it and let it set. It was so good.

“Pennyroyal is good to keep off lice, chiggers, and ticks. You rub it on your body.

“Catnip was the standby for children with croup. It was the first thing they gave to newborn babies. They gave it to children to bring out the measles.

“They just experimented with a lot of things, that’s how they learned. They learned a lot from the Indians.

“Our grandmother would go out to the woods for her roots and herbs. She wore a long apron with big pockets and a gray bonnet. She carried a little trowel to dig with. She’d get ginseng, heartleaf, balm of Gilead buds. She’d get all these and come back with



her pockets full. Mayapple roots, snake root, star root . . . ”

Arley Laymon knows more about the mountains and the woods than most people. He knows where every herb grows and what it's used for.

Arley: “Goldenseal is good for the stomach, throat, and kidneys. Boil it and make a tea out of it. You can put it in your mouth for cold sores. You've got to get way back in these mountains in the rich places to find goldenseal. It just grows in certain places. It's worse to find than ginseng.

"Rat's vein is good for the stomach and kidneys. You make a tea out of it. I used to make it just to drink. Makes a good tea. Better than what you buy.

"White oak bark is good if your bowels is running off. You use the inside bark. You got to skin it up the tree. If you're throwing up, you got to skin that bark down the tree. Sweetgum bark will work the same way. We'd get wild cherry bark and sweetgum bark and make our kids tea out of it when their bowels was tore up. That makes good cough syrup, too. Make tea out of it. Put sugar in it. Then boil it down to a syrup.

"We about raised our family on ground ivy tea. It's good for breaking hives or measles out in kids. Runs them from the inside out. Tea made from sage grass is good for scarlet fever.

"Poke berries is good for the rheumatiz. Mother used to make wine out of the berries all the time for people with rheumatiz.

"We had an old country doctor that would come out. When I was a baby he came out on the mountain to see me. I had the fever, double pneumonia. He rode out there on horseback. After he looked at me he told them if I was alive the next morning to call him back. He didn't have no hope for me at all. I was that far gone. He gave me some

kind of pills. They used to carry them in their bag. I made it through that pneumonia!

Here are some more remedies from old timers.

"Put a garlic clove in your mouth for a cold. It's better than doctors or shots. If it doesn't get rid of your cold, it'll sure get rid of your friends!"

"For cough syrup, mix up a four-ounce bottle of glycerine, one quart of honey, a tablespoon of eucalyptus, and a bottle of pinex. Pinex is made from pine trees. It's hard to find now. Then add boiling water till it's thin enough to drink."

"This is a strengthening medicine. Take witch hazel twigs, yellow dock root, burdock root, dandelion root, comfrey, red clover blooms, mint, and queen of the meadow. Add some old-time molasses. Boil it up in an old lard can into a thick syrup. Just take a spoon of that a day. It'll get you back on your feet."

The Tucker sisters have a special remedy for pain. **Ines and Johnnie:** "This is our own concoction. Take two tablespoons dried marijuana. Crush it up into a bottle of rubbing alcohol. Rub it on where you're hurting. I guarantee you, it'll take the pain away. It's the best that you ever saw. Why, we keep it all the time.

"Where do we get the marijuana? Well, that's another story. We grew it right here in the garden

with our flowers. One year, I planted my row of flowers in the garden. Well, two of these plants came up. I didn't know what it was. That summer we had a preacher who helped tend our garden. He plowed it and hoed it. We were out there getting the weeds out one day. He pulled one of the plants up and sailed it out of the garden. I said, 'Hey, that's a flower of some kind.'

"He said, 'Oh, I didn't know that.'

"So we left the other one to grow. Well, it grew and it grew and it grew, until it was as tall as this ceiling. The trunk of it was as big around as my wrist. Well, we still didn't know what it was till my

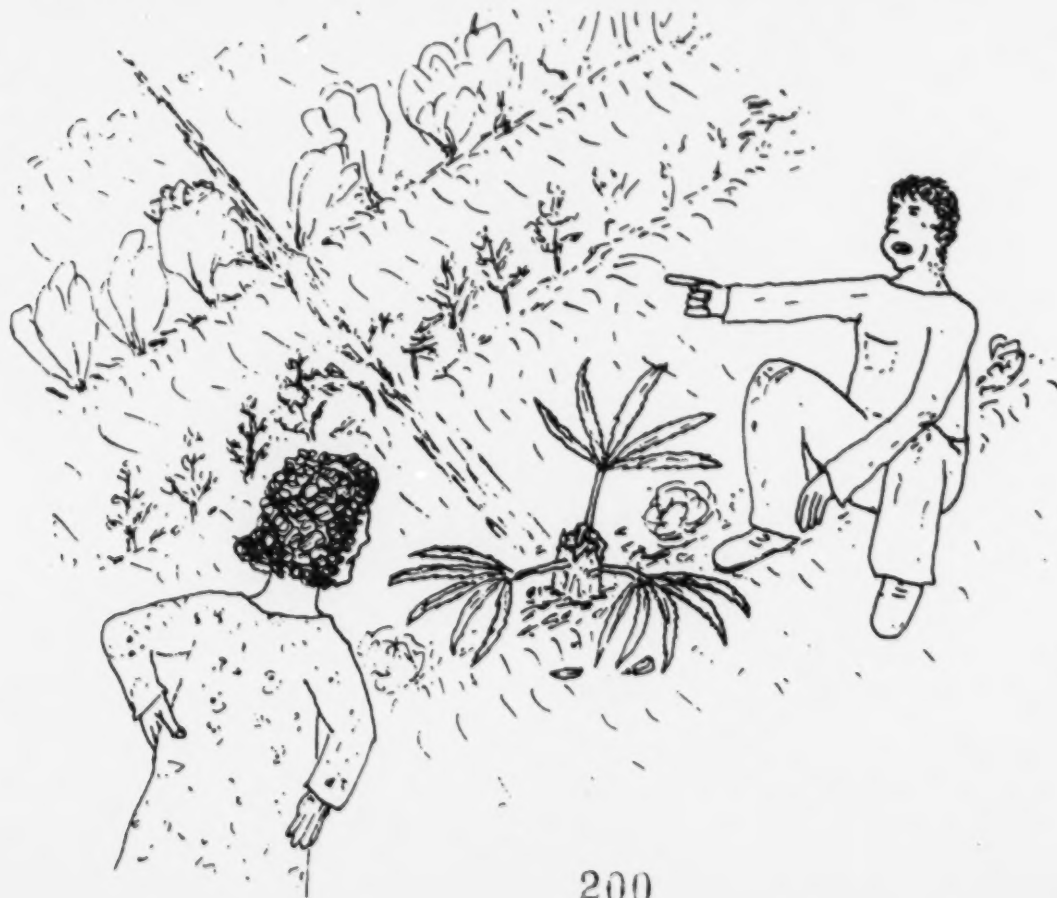


brother-in-law came to visit. He always went to the garden first thing. He called out, 'Come here, girls.' We went out. He said, 'What do you mean growing marijuana?'

"We said, 'What are you talking about?'

"He said, 'Well, that's marijuana. But you can tell people it's wild parsley.'

"But honest, we was innocent. We had no idea. We was waiting for the flower to bloom. We thought we had grown a really beautiful flower. Well, it just got bigger and bigger. So one night, somebody spotted it. The next morning you could see where



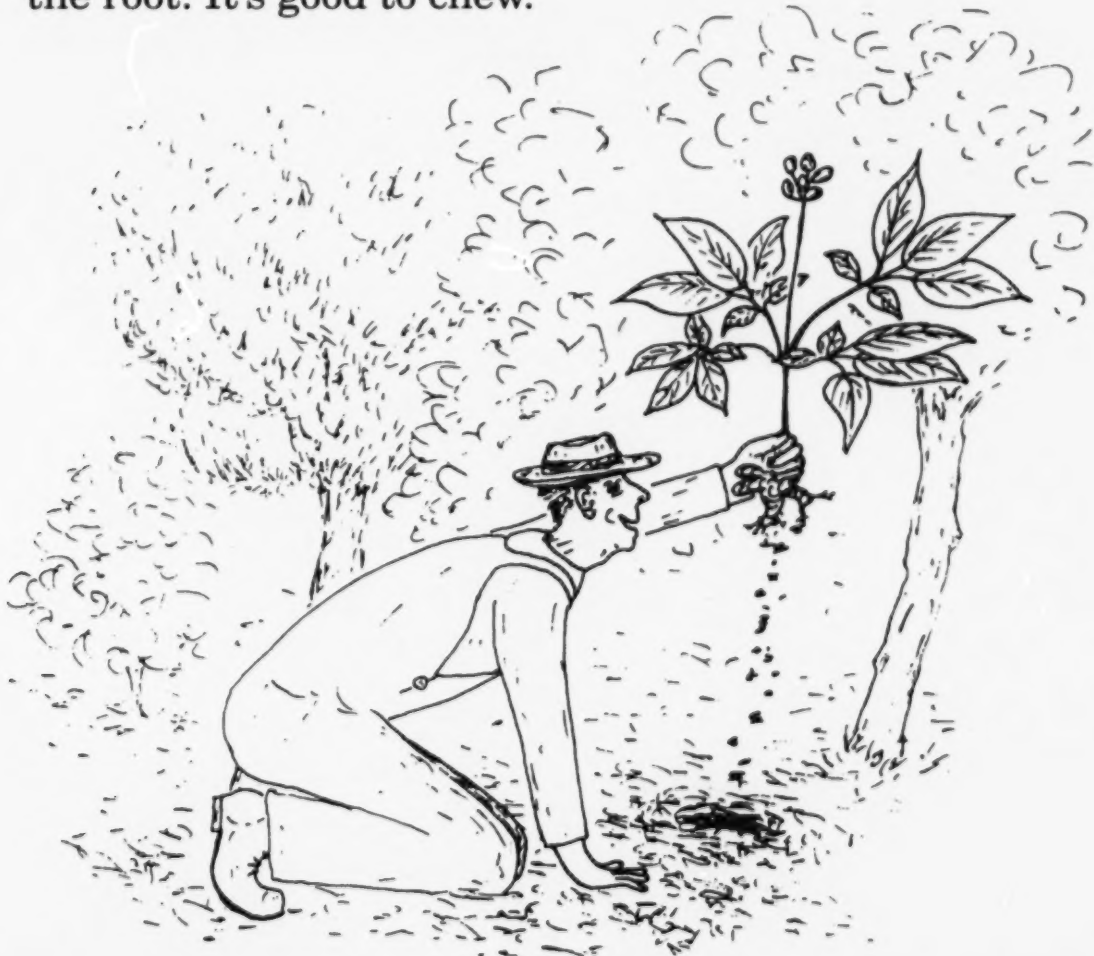
they cut it down. They used an ax, it was so big. They drug it out through the garden. But they left the lower limbs. So my brother-in-law said, 'Gather that. That'll be good for something.'

"So I did. I dried it and put it in the freezer. So when I heard about this remedy, I mixed it up. We call it maricol. It's really good. We can't go to bed without our maricol. We just rub it on. Sometimes you have to rub it in two or three times. One woman had arthritis so bad she couldn't walk. She's the one told us all about it. She said that was all she was using. She wasn't going to the doctor. She said, 'I'm walking and feeling better than I ever felt in my life!' "

The Magic Herb

An herb that cures everything, improves your sex life, and pays for your groceries! Too good to be true? Well, ginseng, or sang, can do all this. Or at least a lot of people think so.

Arley Laymon: "Ginseng's bound to be good for a lot of things. About any kind of medicine you buy at the drug store has got it in it. The Japanese use it for tea. I've dug thousands of dollars worth of it to sell. It's over \$100 a pound now. I drink the tea and chew the root. It's good to chew."



Ines and Johnnie Tucker: "All our generation have dug ginseng. It's good for everything. The root is in the shape of the human body. The Chinese and Japanese love it. I'd love to go look for it. You go in September when the berries are red. They used to mix it with whiskey. Everyone would take a spoon every night."

Ginseng has been used for medicine in China for 5000 years. They believe that it is a magic herb and will cure many diseases. Even the shape of the root is important. A root shaped like a man is very valuable.

The early settlers found ginseng in the Tennessee woods. They soon found out that the Chinese and Japanese would pay a lot for it. It was sometimes worth its weight in gold. Both the Indians and the settlers dug and sold it. Ginseng was a major crop in the U.S. before World War I. The U.S. sold 160,000 pounds of ginseng worth over a million dollars in 1906.

Soon they had dug up almost all the ginseng. They didn't replant the seeds. Ginseng only grows in the shade of the forest. Many of the woods had been cut down. So it's hard to find it today. But people still hunt it. Sang hunters know a lot about nature. They know where ginseng grows and what it

looks like. They look for it under big trees on damp northern slopes. A good sang hunter can spot a patch across a gulf.

Today most hunters are careful when they dig ginseng. They don't dig young roots. They replant the seeds. A Tennessee State law now says you can only dig ginseng from August 15 to December 31. That's when it has ripe seeds. In 1984, people in Tennessee sold about 12,000 pounds of ginseng for about \$125 a pound. That's one and a half million dollars worth.

Lots of mountain people make a little extra money by digging ginseng. Chewing on ginseng roots may not make you sexier, but selling it has kept food on the table for a lot of poor mountain people.

Midwives and Granny-Women

The early settlers lived far from towns, doctors, and hospitals. When it came time to have a baby, some women just did it alone. A neighbor might help. But most women had a midwife or a granny-woman to help.

Arley Laymon: "When we was born my mother had a old granny-woman. She lived a way back on Fredonia Mountain. She'd walk across that gulf and down to where we lived on the mountain."

Midwives knew a lot about delivering babies. They learned from other midwives or from their mothers. Sometimes they just learned from experience. Some of them helped when cows and horses had problems giving birth, too. They helped because they wanted to. They didn't charge for their work. Sometimes a family gave them a few dollars.





Later on, there were more doctors. They had cars and could get to the homes quickly. Then, during World War II, many of the doctors went into the army. Delivering babies was left to the midwives again. The health department gave them supplies and lessons. They taught them to use special eye drops to prevent disease. If a mother has VD (a disease passed by sexual contact) when her baby is born, the baby can go blind. The eye drops prevent the blindness. It is the law now that all babies have to have these eye drops.

Midwives had a hard life. In the old days, they had to walk or ride a horse for miles in cold winter weather. Later on, they might have a truck or jeep



to drive. One midwife had to drive through the woods on old logging roads with a man leading her with a flashlight. Homes were very poor. One home she went to didn't even have a door.

Today, most women go to the hospital to have their babies. Some women want to stay home. They want their family to be with them. They know that childbirth is normal and natural. Not many doctors will deliver babies at home. Midwives still do. They are now trained in schools like doctors.

Blood and Warts

Then I came by and saw you kicking helplessly in your own blood;
I spoke to you, there in your blood, and bade you live.

Ezekiel 16:6

Mountain people had herbs for healing. Sometimes they had a country doctor, sometimes an old granny midwife. But they had something more. They had faith – faith in God, and faith in their own ability to heal. There are a few people still living who know about this kind of healing. Charlie Clark is one of these. He is no longer able to walk. But he is willing to help people if he can.

Charlie Clark: “There was a woman lived down at Brush Creek. She was troubled with bleeding of the nose. I called her up. I asked her about it.

“She said, ‘Yes, my nose bleeds nearly every day. I just can’t stop it sometimes.’



"I said, 'Honey, you just wait. You won't be bothered much more. Now, Mary Jane, don't worry about it no more.' Do you know, after I called her up, she never had a bit more trouble.

"Here, read the verse in this Bible – Ezekiel 16:6. That's it.

"Fellow I knew had a boy in school. The little boy's nose started to bleed. They couldn't stop it. He said, 'Charlie, they told me my boy's nearly dead. They can't stop it. I've got to go down there to the school and see him.'

"I said, 'Just go ahead to see about him. He'll be all right.' Well, I followed him down. On the way I repeated that verse three times. Do you know, when we got down there that boy was so quiet. His nose had quit bleeding. He'd gone to sleep. That wasn't over 30 minutes later.

"That's how I stop bleeding. Anybody can do it. All you've got to do if someone is cut and bleeding bad, all you've got to do is call me on the telephone. Let me know. It'll stop.

"Now, for warts, I have to touch them. I just touch the wart with a wart rock. It's just a small quartz rock. You can find them where the creek comes out of the foot of the mountain. You can find them along the drip line of a house. I guess anyone

can do it. You just touch a wart. Think what you are doing. Study on it. Hold the rock on the wart till it gets sort of warm. That's it.

"One day I was setting out here and a man comes to me. He says, 'Mr. Clark, can you take off warts?'

"I says, 'I don't know. Why?'

"He says, 'Well, I've got a boy that's got one on his elbow. Can't get rid of it.'

"I said, 'Well, bring him down here. Let me see it.' He brought him down. I gave him a treatment. Touched it with the quartz rock. I said, 'Listen. Don't you scratch that. It'll go to itching. Don't scratch it.'

"About three weeks later that boy came up to me. He said, 'Mr. Clark, that wart never did come off.'

"I said, 'What? Don't you tell me that wart didn't leave. Pull up your sleeve. Let me see.'

"He looked and said, 'Why it's gone!'

"Now that is true. I'll bet I've taken a gallon bucketful of warts off people. If I treat you now, it might be a month coming off. It took it a long time to grow. But it'll go. It won't come back.

"I learned how from one of my cousins when I was a kid. I was trying to get rid of my warts. This is what he told me. Count your warts, get that many gravels, and put them in a rag. Go to a fork in the road. Hold the rag behind you. Repeat, 'Warts come



off of my hand and on the next one passes by.' So I started that way. That's the way I learned about the rocks. I don't know how it works. The Lord's with me, I reckon.

"If you don't believe me, just give me a chance. I've got that much faith in it. I know the Bible don't lie. The Bible's the truth. That's what it says right there. Oh, there's a lot more things I'd like to tell you."

Arley Laymon tells his stories of healing.

Arley: "Yes, I can stop blood. I've done that several times. I have to know their full name. I just say their full name and a verse in the Bible. It'll stop the blood. I forget where that verse is at. I'll look it up. That comes in handy a lot of times. There was a little boy who stepped on a half a fruit jar. He was bleeding to death. That verse stopped it. When I sawed my arm up at the sawmill, blood was just pouring off in a stream. There was a guy there who stopped that blood. It never did bleed no more.

"To cure someone's wart, I just rub an old bone on the wart and throw it back over my left shoulder. You don't look back at it. You can use any old bone. You can't cure a wart on yourself. You got to find someone else to do it.

"There's a lot of remedies if people just knew all of them. People don't know what they can do till they try."





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PART SEVEN

Guns and Hunting

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Guns, Guns, Guns!

Almost every family in the Sequatchie area has one or more guns. Some are old. "That's my granddad's old shotgun." Some are fancy new deer rifles with scopes. People are proud of their guns.

People use guns for different things. Some people hunt with them. In a war, people use guns for killing other people. Some people use guns to protect their families. They may use guns to chase thieves away. Elmer Marsh tried to catch some thieves by using a gun.



Uncle Sammy Johnson used his gun to kill a bobcat around 1900.

Elmer Marsh: "People broke into my tool shed here at the sand pit once. They took a bunch of my tools. They put them in a sack and hid them up on the hill. I figured the dirty so-and-so's would be back to get them. Well, when we left for the night, I got out

of the car up on the road. I walked back down here through the woods. I had my rifle and two or three pistols hanging on me. I had a blanket. I got up on that bank. I stayed there all night watching for them. I was in bad trouble because they stole the very things I needed to do my work.

"At that time, I had, well, a machine gun. It was a fully automatic army carbine. It held 30 shells. It's against the law to have one. You could push a button down. It'd shoot 30 just in a flood. I'd have been in bad trouble if I'd caught them. I was mad. I'd have cut them in half in two seconds. I'd be in the penitentiary now. When you get mad, you'll do things like that. But they never showed up. That was lucky for them, and me, too."

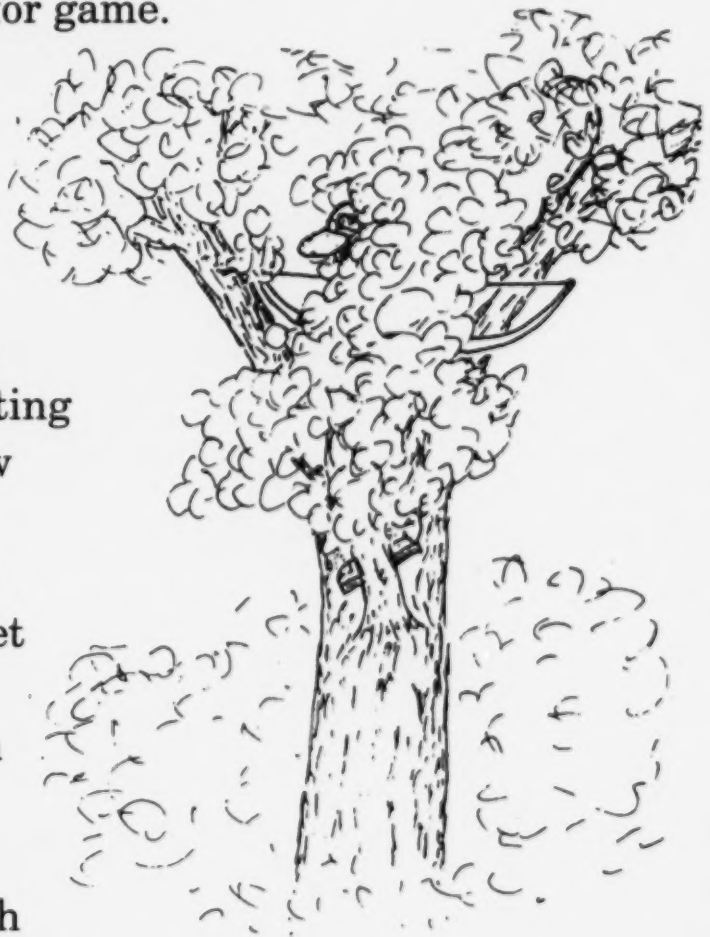


Kids and Guns

Kids who live in the country get their first BB guns by the time they're ten. They soon learn to shoot a .22. Parents usually teach their kids how to use guns safely. They teach them how to handle and clean them. By the time they're teenagers, they are in the woods, hunting squirrels and rabbits. Kids can learn a lot about nature and the woods when they hunt. Some kids get hunting bows. They learn to sit for hours in trees waiting for game.

In Tennessee, ten to sixteen year old kids have to take a course before they get their hunting licenses. They study hunting law, gun safety, use of guns, boating safety, and how to know wildlife.

Sometimes accidents happen. Kids may forget the rules. Making a mistake with a gun can be deadly. Kids in the old days were around guns a lot. Elmer Marsh



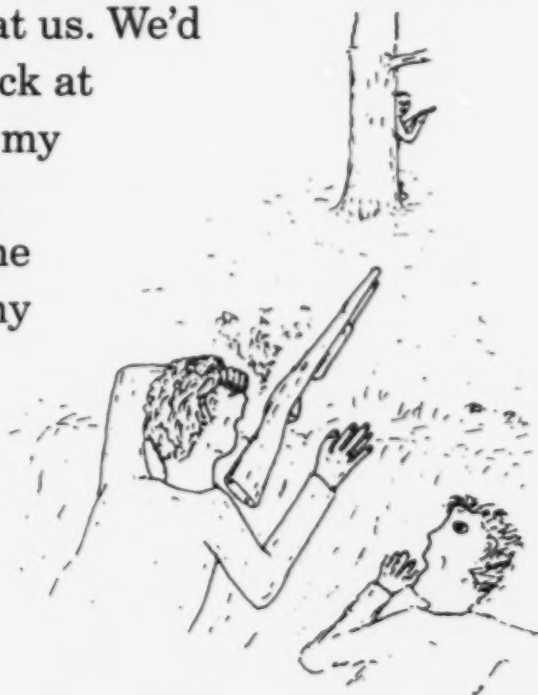
and D. Wooden remember when they were kids with guns.

Elmer Marsh: "When I was a kid we always had air guns. One Christmas I got a new high-powered one. Me and a chum of mine was going around shooting at everything in the woods. This fellow came up. Sort of a rum-dum fellow. He was 20 years old, acted like a 10 year old.

"He kept saying, 'Let me shoot. Let me shoot.'

"So we let him take a turn. But he kept my friend's gun. Wouldn't give it back. He wouldn't let us go home. My friend started to cry. We were scared.

"We ran on ahead of him and jumped in a ditch. He hid behind a tree. Every time we'd stick our heads up, he'd shoot at us. We'd raise up and shoot back at him. Anyway, I stuck my head up at the wrong time. The pellet hit the bank and went into my eye. Went right through the eyelid and into the retina (area at back of eyeball).



"The doctors wanted to take my eye out. They said there was only one chance in a thousand they wouldn't have to. My dad wouldn't let them. He said, 'Let's take that chance.' It was swelled up and red for a year or two. If they had taken it out, I'd have had a glass eye. It finally cleared up. I never could see much out of it. Just a blur."

D. Wooden: "Me and J. D. was squirrel hunting one day. Had a .22 rifle. J. D. was carrying the rifle. There was an old cow standing off in the woods chewing her cud. Them ears were stuck straight out. J. D. says, 'Wonder what that cow would do if I'd shoot a hole in her ear.

"I said, 'I don't know. Just jump and run off, I guess.'

"He said, 'Let me take rest off this tree. We'll see.'

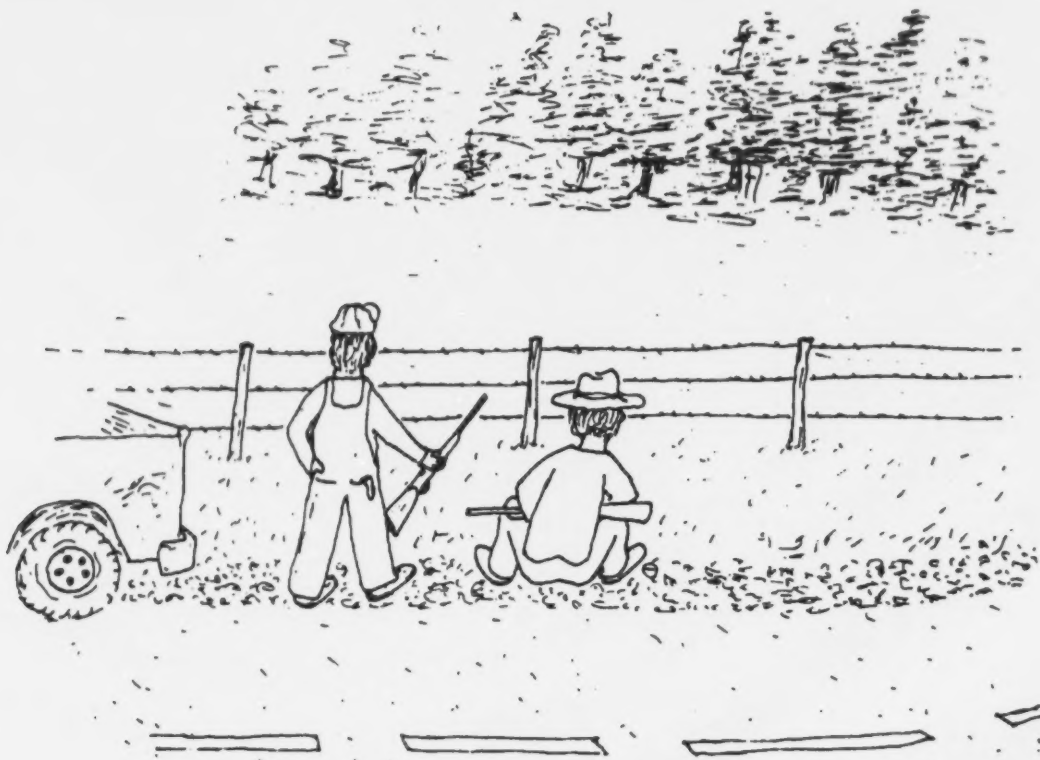
"Well, if she'd moved just a little, he'd have shot her in the side of the head. But he shot a hole right through that cow's ear. She just flew, slinging that ear!"



Hunting and the Law

People in Tennessee hunt deer, rabbits, squirrels, coons, wild turkeys, doves, and quail. It's against the law to hunt without a license. You can only hunt at certain times of the year. Most people follow the laws. They hunt safely and in season.

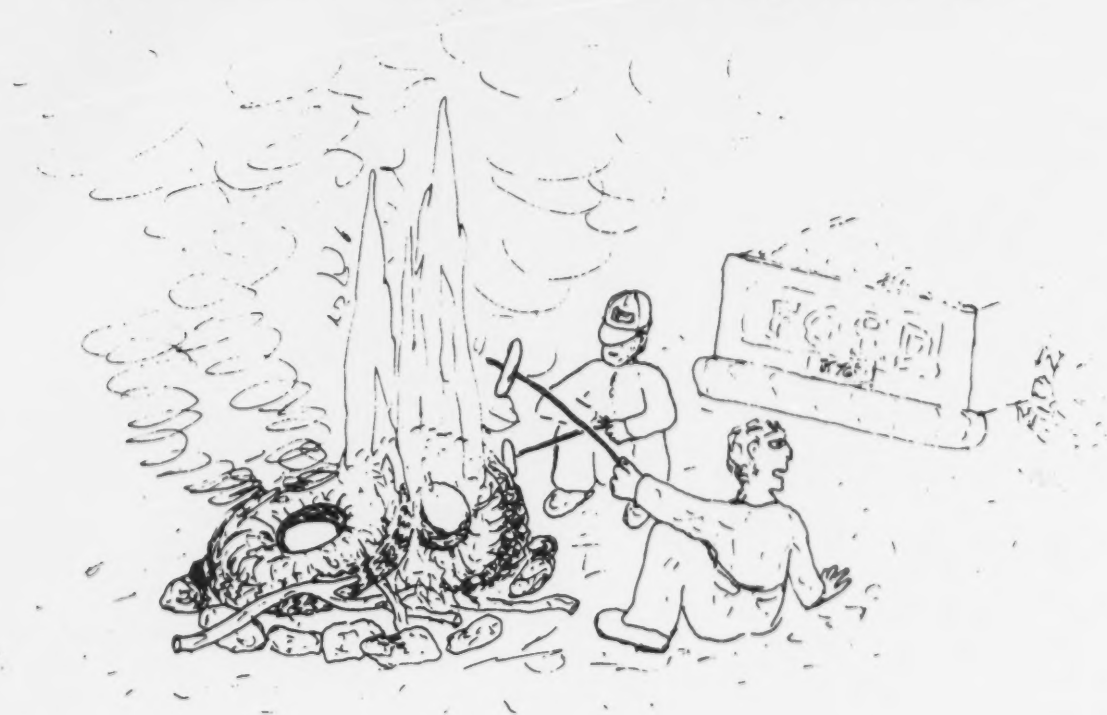
Some people don't follow the laws. They hunt out of season. They hunt without a license. They hunt deer with dogs. Men take trained hunting dogs to the woods. The dogs run into the woods and chase the deer out. The men stand on the road. They shoot the deer when they run out of the woods. That's one way to fill the freezer with meat. But is it hunting?



Hear Those Dogs?

Not all hunting is done with guns. In Tennessee, there are two kinds of hunting which don't use guns. And nothing gets killed.

Fox hunting, or fox racing, is mostly a chase. The hunters let the foxhounds loose. They find the trail of a fox and chase it, barking loudly. They may chase the fox all night. The hunters don't shoot the foxes and the dogs don't usually catch them. The men sit and listen to the barking of the hounds. They build a fire and talk and eat. Sometimes they put old tires on the fire and roast weenies. They brag about their dogs. The next morning, the tired dogs come back.



The men put them in their truck and go home. That's fox racing! D. Wooden and his friend Veon tell about their years of fox racing.

Veon: "If you want to find out about fox racing, you better talk to someone that's got some good dogs."

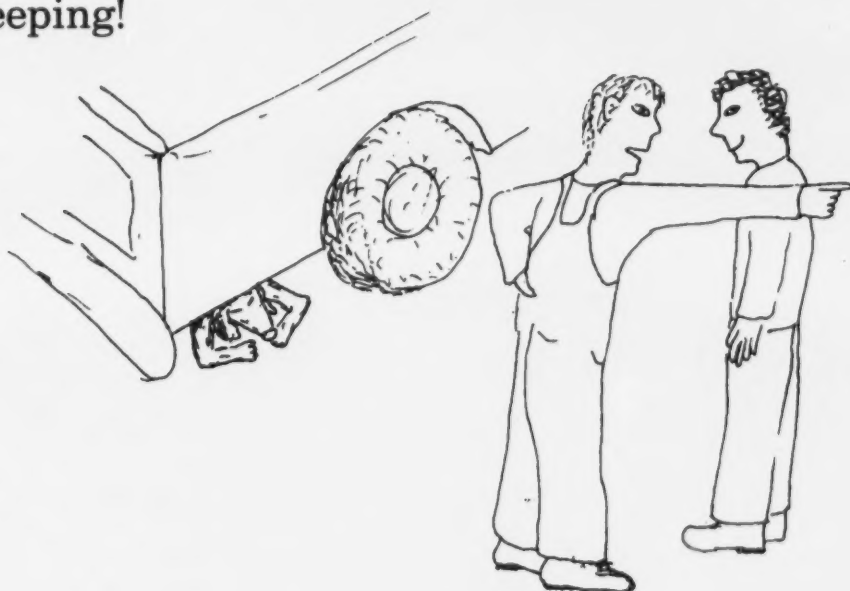
D.: "Well, I hear mine (barking) a whole lot. Kind of hard to hear Veon's. We got some good dogs. Need some good foxes. I believe the dogs would run them.

"I don't know what it is about fox racing gets a body interested in it. Everybody wants a good dog. A dog that'll do good in a race. It's just a pretty good sport. You get out there and turn the dogs loose, then set and listen at them run the foxes. If your dogs do good, you get a big bang out of it. You can tell if your dogs done good by listening at 'em. You can tell your dogs' mouths (bark), you know. After you run them awhile you can tell the difference in their bark. Where there's two barks kindly alike, you'll be fooled. I like for mine to bark kindly like Veon's so I can claim they're mine! (He laughs.)

"We've laid out all night before. Go out away from anybody's house where we won't interfere with nobody. Turn our hounds loose. Build us up a fire. Set there and listen at 'em. I like to stay all night

when we go. You don't hear no race laying in bed asleep. Throw a piece of foam rubber out and an old sleeping bag. Take a little grub along to eat with our coffee. Set there and lie to each other till daylight.

"No, I'll tell you. Fox hunters don't lie. People thinks they do, but their memory's what's bad. They just forget how things was. They'll think they hear their dogs, when the dogs is under the truck a sleeping!



"I fooled Frank one night. His dog hadn't been let loose more than 15 minutes when it come back in across the field. Frank didn't see it. I thought, 'I'm going to see if he hears that dog tonight.' I caught the dog. I put him in the dog box in the back of my truck. Frank set around that truck all night. He never knew ol' Red was in the truck. He thought he heard

ol' Red a racing a fox all night. I'd ask him every little bit, 'Frank, do you hear ol' Red? Is he in that race? That's a good race. I thought I heared him a while ago.'

"Directly, Frank would think he heared ol' Red. "That's him right there,' he'd say. Of course, ol' Red was right there in that box. But I never let on.

"Next morning he seen ol' Red in my truck. He said, 'When did you put ol' Red up?'

"I said, 'About 15 minutes after you turned him loose last night.'

"He said, 'You never done it.'

"I said, 'You just ask Mark.' Well, he believed it then. He said, 'I wasn't sure I'd heared him.' (D. laughs.) I figured it'd make him mad, but it didn't, I reckon. But you can have every kind of trick pulled on you!

"Fellow from Dunlap, Major Johnson, come out here and went with us one night. He had three good dogs. They was running good. We was having a good race. It was way up in the night, around midnight. Major said, 'Boys, I believe I'll lay down.' He spread his blanket. He took his hat off and put it over to the side. Emery was setting there in a chair. Directly, Emery got to saying, 'Here, come here. Whose dog is that?'

"There wasn't any dog there. But I knowed what he was doing. I said, 'Why, that's one of Major's old dogs.'

"Emery said, 'Get him and put him in the box.'

"I said, 'There ain't no use of that. If he was any account, he'd be in the race.'

"Major's laying there like he was asleep. These dogs was just tearing it up, barking, coming around the ridge. I said, 'Oh, just leave the dog alone. He might go back to the hunt, but I doubt it.' We just hushed.

"After a while Major just turned over. Had that blanket over his face. He reached for his hat. He was trying to look around for that dog. Directly, he says, 'What are you boys trying to do? You'uns is pulling my leg, ain't ya?'

"We about died laughing! I'll tell you, if a body's sound asleep and you 'see' one of their dogs around when the rest is out running, you'll see how asleep they are. Yep, there ain't nobody likes for their dog to quit. Dog that'll quit ain't no account. If a race is going, a good dog will stay in there.

"I've heared them run for 14 hours. Some dogs won't hardly quit at all. They'll just run till they can't run no more. I've seen them in so bad a shape you'd think they wouldn't run if they had any sense.

Feet sore, all scratched and tore up. They'll lay around a day or so. Then they'll be ready to go again.

"We took our dogs over to Hubert's to run one night. Hubert's dogs had been out a week or two. Dogs will lay out eating on a old dead cow or hog. They'll run at night. Those dogs come in that evening. Their feet was bleeding. They was poor and hobbling around. Hubert fed them. He said, 'I'll just leave them out. If they want to run, they will.'

"Well, we was having a pretty good race that night. We thought we had some pretty good dogs. They'd run about an hour when we heared one of Hubert's old dogs, ol' Whitey. Then we heard ol' Speck. I'll tell you what. Those old sore-footed skinned-up dogs just took that fox race away from our dogs!

"They run that fox. Hit was a sight. Ours just hushed. I said, 'Frank, we ain't got nothing that's worth feeding.' Ours wouldn't have run at all if they'd been in the shape those dogs was in. Now bud, they had the grit."

"There's nothing like a foxhound. They're bred to run foxes. Just any dog won't run a fox. Most dogs if they can't catch something, they'll quit. There's

several breeds. Mostly Walker hounds. Foxhounds will run a coon but they won't bark treed. Most of them will run a deer. They'll just leave the country after a deer. You'll lose your dogs.

"People used to train the dogs to come back to a horn. Hubert trained his dogs to come to a horn. He'd blow it and they'd come in even if they was running a fox. When I was a boy you could hear the fox horns all day on Mondays calling the dogs in."

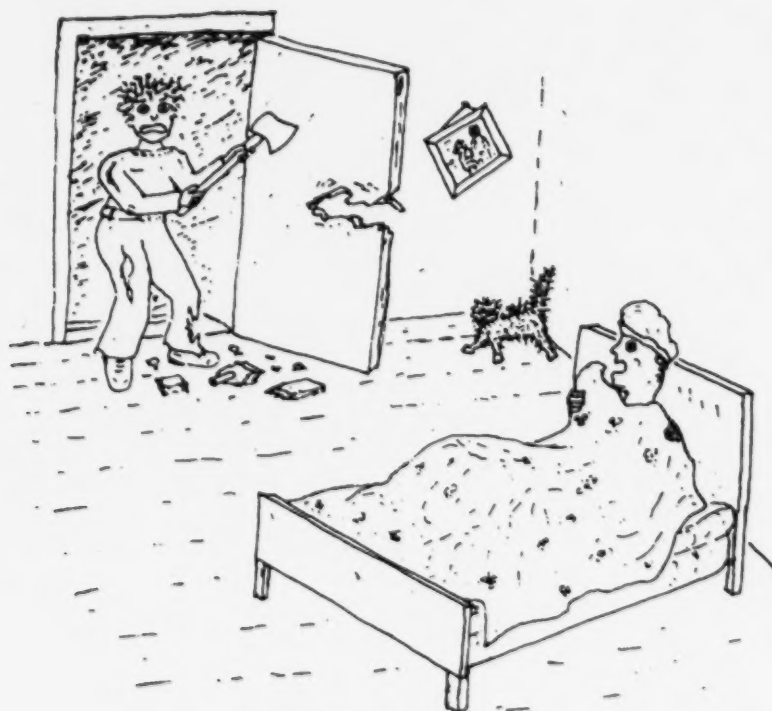
"My Uncle Hubert was scary at night. You could scare him with a noise. One night he and Dow was going to walk towards each other's houses with their dogs. They was about five miles apart. When they met they was going to turn their hounds loose. Back then people walked most everywhere. Hubert was following an old trail. The dogs were up ahead of



him. They got to barking. They ran back to Hubert. Their fur was up. They was scared. It scared Hubert. He thought they'd run up on some big varmint.

"He just turned around and run plumb home. The front door was buttoned. He grabbed up the chopping ax as he run through the yard, knocked the latch off, and run on in the house. He hadn't been gone long. His wife had went to bed. He kindly scared her. She raised up in bed and said, 'What's the matter, Hubert?'

"He stood there in the middle of the floor with a chopping ax in his hand and said, 'Just lay there and let something eat a man up!'



"Now, Dow knowed what had happened. He had waited for a while to start so he wouldn't have to walk so far. He'd stop every little while and listen for Hubert. He'd let his dogs loose. They'd run on up that old trail. So when they met the other dogs, they scared each other. But Hubert didn't stand around to find out. He said later on, 'I'll tell you what. I just knowed they'd run up on some kind of big varmint. Why, I could hear that thing right on my heels all the way back to the house!'"

"Anything cooked out that way is good. Seems like it's better than it is at home. Everybody has fun whether they have a good race or not. My wife made a apple cake for me one night. We had coffee boiling on the fire. We ate part of that cake with the coffee. Then we laid down and went to sleep. The cake was on the ground in a bag. Major woke up before daylight. Stirred up the coals. Set the coffee pot on them. Cut himself a big chunk of the cake. He ate it and drunk his coffee.

"Later on, daylight come. I got up and got me a piece of cake and a cup of coffee. I thought the color of the cake was kind of funny. Sort of reddish. I got to looking at it. I said, 'I want you to look at the ants on this cake.'

"It was teetotally covered up with these sugar ants. Ol' Major reached up, rubbed his throat, and said, 'Reckon them'll hurt a man?'"

"I laughed at him and went to blowing the ants off that cake. I said, 'I don't know, Major, but we'll know in a few minutes because you're full of them!' He coughed and spit for half a day. He sure ate a bunch of them little ants!"

"Fox hunting is the only kind of hunting that's left where you can follow the dogs, even across private property. They used to do it on horseback. They'd follow the hounds. I reckon that foxhounds is the only dog called a free-running dog. Within 50 miles of its home by law it's allowed to run across anybody's land. You're allowed to follow it. It's the law you can cross private property. Of course, you have to pay for any damage. But they don't bother much. They just run what they're after till it gets away or trees. Sometimes they catch a fox and kill it. But they're mostly a running dog."

"One day we was going along the top of Sale Creek Hill with the foxhounds. This ol' dog of Charlie's was leading. Doc said, 'Charlie, what happened to that dog's tail?' It was almost S-shaped, it was so crooked.

"Charlie said, 'If you'd run these crooked creeks as fast as that dog has, your tail would be jerked out of joint, too!'

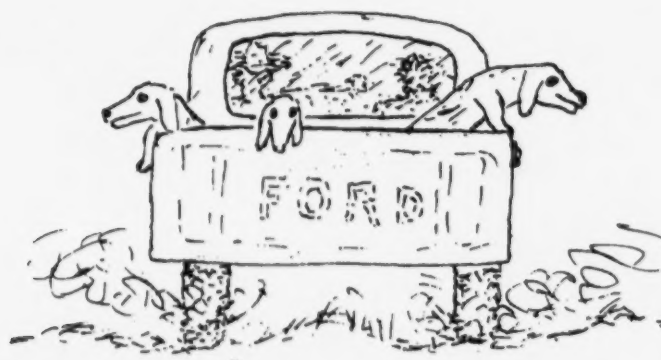
"Doc said, 'That'll do it, all right.'"



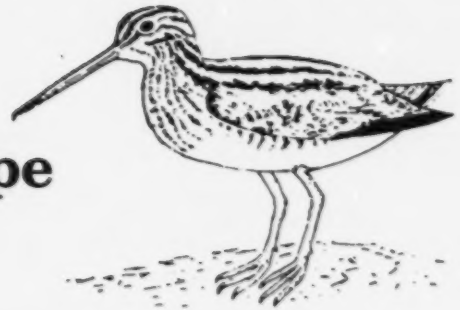
"A body has a lot of fun. I get a big bang out of going out and turning the dogs loose. Lots of people goes out and drinks and goes on. I don't like that. That ain't what I go for. I'd druther just leave my dogs at home if I'm going to drink. There ain't nothing wrong with taking a drink if there's any sense in you. But after a few drinks all you can hear is your mouth. Can't hear the dogs.

"Fred gave me my first hound about 25 years ago. I've had them ever since. I've laid out a many a cold night on account of him. I told Fred, 'I'm going to sue you for damages for giving me that hound!'"

"Veon, do you think your dogs might be ready to go tomorrow night?"



Hunting the Wild Snipe



The other kind of hunting that doesn't use guns is snipe hunting. The snipe don't get killed. But sometimes the hunters get pretty mad! A lot of people in Tennessee went snipe hunting when they were kids. D. Wooden remembers his first (and last) snipe hunt.

D.: "James, you never did go jack snipe hunting, did you?"

James: "No, I never did get to go." (He laughs.)

Veon: "Yeah, I've been."

D.: "I'll never forget it. Lester and Doyle got the hunt up. They was rounding up a bunch to go. Us kids was up at the store. Lester come up. He told us, 'Now, boys, we're going jack snipe hunting tonight. If your pap will let you, you can go with us.'

"Well, that just tickled us to death. Getting to go jack snipe hunting. We had to ask Pap. Whenever we went anywhere, we had to ask. If he said no, you might as well hush.

"He was watering the mules. He said, 'Well, boys, I don't care, if you'uns will behave yourselves.'

"That was kind of unusual. He just agreed right off. I never thought nothing about it at the time. Of course, he knew all about the snipe hunt.

"We went up to Lester's. We took a big sack with us. Us boys was going to hold the sack. The men was going to drive them in.

"They took us way off down in the woods to a little holler. They figured they'd get us boys lost.

We was half scared. We didn't have no light. You gotta be in the dark to catch them. They found the right place for us to hold the sack. They told us, 'Now, boys, you'll have to be just as still as a mouse and hold this sack. Don't make no racket at all.' They showed us how to hold it. Two at a time held it.

"The men said they was going to go on down the branch and drive the snipe right up that holler into the sack. Buddy, you could hear a pin drop. We





held that sack for the longest. We didn't say a word. It was so quiet, we was sure we could hear them coming!

"After a while, we quit hearing them. Our arms got tired of fooling with that sack. Finally, we got to whispering around. We decided to cut a couple of sticks and prop up the bag. We got it fixed so the snipe could go in it. Then we sat up on the hillside. We was quiet. Boy, I'll tell you what, we was serious. Of course, there never did nothing come.

"Well, after a long time, we got to hearing a racket on the hill above us. It wasn't coming up the holler. We got to hearing sticks a breaking. Talk about the hairs standing up on the top of your head. We saw something white a coming. It looked awful big. It was making a terrible racket. We was scared to death. Well, I had a flip (sling shot) in my pocket and some marbles. I shot my marbles at it. Of

course, we didn't know what it was. But it was big and stood a way up. I just cut loose at it with that flip. I hit it and got it to moving.

"We all took off chasing it. We were shooting pretty hard. It went straight back toward the house. We run it over a barb wire fence. Come to find out it wasn't nothing but Doyle with a sheet wrapped around him. That barb wire tore the sheet right off him. Some of them marbles had hit him pretty hard, too. But I tell you what, we was scared!

"When they'd left us holding that sack, they'd just went back to the house. They was just setting there talking and laughing. Wondering how long we'd stay. They'd have left us all night. They wouldn't have come back at all. But Doyle come up to scare us.

"There is such a thing as a snipe. It's a little ol' brown bird. Looks like a quail, long bill. But they don't come in droves. You can't drive them. You don't catch them like that. It's just an old joke. They'd have kept us out there all night with no light. We set up there and watched that sack. Didn't say a word. Oh, my goodness. Kids don't forget stuff like that!"

PART EIGHT

The Meaning of Science

The Fear of Science

Science and technology have helped people live better and easier lives. Water wheels made it easy to grind grain and cut wood. Today, it is even easier with electricity and gasoline engines. People can get places fast in cars. Almost everyone has electric lights. Modern medicine cures diseases that herbs can't. Water treatment plants make water safe to drink. Modern farms grow more food than we can eat.

But people have always been a little afraid of new ideas. In the 1800's and early 1900's, new technology was everywhere. Steam engines, sewing machines, gasoline engines, airplanes, electric lights, and cars were all invented then. People feared these new *inventions*.

This song was written before 1900. It's a funny song. But it shows a fear that machines would get out of control.

The Steam Arm

A curious story I am told
About a soldier fierce an' bold.

Refrain:

Tura, Lura, Lay.

In Ole Virginia, he lost an arm,
Which caused him pain and much alarm.

Refrain.



He went home one Saturday night,
His wife abused him left and right.
He had no arm; he could not fight.
Refrain.

He went to a man by the name of Mean,
Who said he could make him an arm of steam.
Refrain.

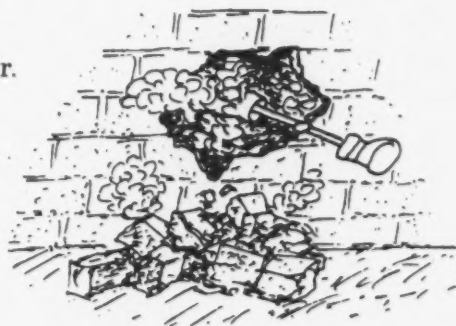
He fitted it on so nice and true,
And set it ta-goin' by turnin' a screw.
Refrain.

He then went home an' knocked on the door.
His wife's abuse began to pour.
The steam arm knocked her flat in the floor.
Refrain.

They took him up before the mayor.
The mayor said, "Hit me if you dare."
The steam arm knocked him out of his chair.
Refrain.

They put him in jail for causin' alarm.
Down fell the wall. Out popped his arm.
Refrain.

Now what in the world will the people do?
The Devil himself can't turn that screw.
Refrain.



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The people in Dunlap weren't too happy about new technology either. In 1903, there was a coal miners' strike. The headline in the paper said, "Machines Cause Trouble." The miners said they earned more money before the machines were put in. The mine president said that the miners were not doing their duty by the machines. He wanted the men to produce more coal by using the machines.

Some Tennesseans found that new technology was just plain dangerous. Poor Mr. Smith's new car ran away with him!

HORSELESS CARRIAGE RUNS AWAY IN MARION

Jasper, Tenn., July 28. — Strange to relate, a horseless carriage ran away in this county yesterday. The driver of the vehicle, Henry Smith, was thrown out and badly bruised up, and two other men who were with him were also injured slightly. Smith had purchased the vehicle, a horseless carriage, better known as an International motor vehicle, from the Kelly garage at Jasper, and after a few turns around the square decided he knew enough about the machine to drive it to his home twenty miles away. It was nothing at all like Sheridan's famous ride to Winchester twenty miles away, except in the matter of speed; for Smith's driving had been limited to level ground and descending

a hill was another proposition.

On Gordon Hill two miles from Jasper he reached his Waterloo for, as he surmounted the crest and started down, the machine gained speed. Smith had not mastered the brake devices and he lost control. The result was the machine plunged down the hill, a long and steep one, and halfway down was ditched, changing ends as it did so, apparently with a desire to go up the hill and try it over. The top hamper was all smashed off and the occupants narrowly escaped serious injury. It was towed back to the garage to be repaired, Smith and his friends going on to their homes in another machine, having had enough excitement for the day.

From Sequachee Valley News
August 2, 1917

New ideas about the history of life on earth worried people also. In 1925, in Dayton, Tennessee, a high school teacher was put in jail because he taught the *theory* of evolution in biology classes. Some religious groups didn't think evolution should be taught in the schools. The trial of John Scopes put Dayton on the map forever.

This song was written by Uncle Dave Macon. He was one of the first Grand Ole Opry singers. It's about religion and evolution.

The Bible's True

Spoken: Now I don't believe in evolution or revolution, but when it comes to the good old Bible, from Genesis to Revelations, I'm right there.

Evolution teaches man came from a monkey,
I don't believe no such a thing in the days of the week of
Sundays.

Chorus: For the Bible's true, yes I believe it,
I've seen enough and I can prove it,
What you say, what you say,
It's bound to be that way.

Lordy, yes!

God made the world and everything that's in it,
He made man perfect and the monkey wasn't in it,
What you say, what you say,
It's bound to be that way.

I'm no evolutionist that wants the world to see,
There can't no man from anywhere, boys, make a monkey out of me.
Now ain't that right!

God made the world and everything that's in it,
He made man perfect and the monkey wasn't in it.
You know I'm right!

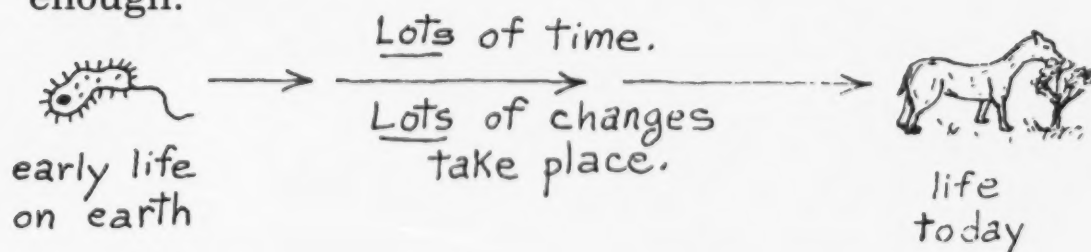
God made the world and then he made man,
Woman for his helpmate, beat that if you can.

Uncle Dave Macon
Written by Uncle Dave Macon
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In the 1800's, Charles Darwin and other scientists studied thousands of plants, animals, and fossils from all over the world. The scientists were looking for a way to explain why there are so many different kinds of life. They were trying to find out why living things are alike. Almost all life has to have air. Most plants are green. Many animals have four legs. All insects have six legs. All young look like their parents.

Darwin and other scientists who studied rocks and fossils knew that fossils were the remains of plants and animals that lived millions of years ago. Most fossils are very different from life today. The fossils show that plants and animals have changed over time.

The changes were small and took millions of years. But the Earth is over four billion years old. That's 4,000 million years! A lot of changes can happen in that much time. The changes seemed to make the plants and animals fit into nature better. Some died out (became *extinct*). They didn't seem to fit well enough.



Darwin looked for ways to explain these observations. This led to the theory of evolution. Darwin's studies showed that all life could have come from changes in simple living things of the far past. He said that all the plants and animals that live today and those found as fossils are related. Our wonderful variety of life on Earth is a result of hundreds of millions of years of small changes.

This doesn't mean that people came from monkeys. It does mean that people, monkeys, and other animals may have had the same *ancestors*. But that was many changes and millions of years ago.

Today scientists are learning more and more about these ideas. They have found that the *cells* and even the chemicals in all living things are very much alike. There are many new ideas about evolution. These new ideas have changed the theory. They have made it better. That is what science is all about – new ideas and the search for truth.



Which of these cells is from a jelly fish and which is from a horse ?

The theory of evolution has been used by scientists to make accurate scientific predictions and to study nature for over 100 years. Much of our modern medicine, farming, forestry, and biology are a result of this theory.

Some religious groups in America still don't agree with the theory of evolution. They say that God made every kind of living thing separately and at the same time. They say that different living things are not related to each other. They think that evolution is an idea of people who don't believe in God. However, Darwin was a very religious man and many people who study the theory of evolution today believe in God. But scientists believe everything that happens in nature has a natural cause and a natural explanation. They want to find out what the causes and explanations are. Religion is also searching for answers to the mysteries of nature. The miracle of life remains a wonder for all of us.

Information, Please

science – a way of thinking about nature

- Scientists study nature. They take note of what they see and learn from their observations of nature. They figure out ways to explain what they've seen. These explanations are called *theories*. They sometimes try experiments to see if their theories are right.

theory – a way to explain something

- A **theory** has to fit all the known facts and observations. (An observation is something that is seen.) If new facts or observations don't fit the theory, then the theory is changed to fit the new observations.

A good theory can be tested. A theory may be proved or changed by experiments. A theory can help predict the results of an experiment.

There is a theory that people get fat because they eat too much. This fits the fact that more food can make animals get fat. It fits a lot of observations. Fat people often eat a lot.

Is this a good theory? A scientist would ask, "Are there any facts or observations that don't fit this theory?" Some people eat a lot of food and stay skinny. This may not mean that the theory is wrong. It may mean that the theory needs to be changed or added to. It is a known fact that exercise uses up calories. The theory could be changed to say that people get fat because they eat too much and don't get enough exercise.

But a good scientist wouldn't stop there. There may be other facts and observations that could change the theory even more. In this way, it will become a better and better theory. It will get closer to the truth.

To test our theory, we could figure out some experiments. We could take two groups of people and feed one group more than

the other group. We could predict that the people who ate more would gain more weight. We would observe both groups and see if the results proved our theory. If the results didn't prove the theory, we would have to figure out a way to change the theory to fit the new observations. Even if the results did prove the theory, we would still need to try more experiments. This testing goes on and on. Not many theories are ever proved to be 100 percent true all the time. That is why science is always changing – to try to get as close as possible to the truth.

experiment – to try or test in order to find out something

- People do **experiments** to find out things. Babies experiment when they first try to talk or sit up. When a new soap or toothpaste is advertised, people try it out. They want to see if it works and if they like it. That's an experiment.

technology – the use of science to help people

- Science gives us new ideas. **Technology** tells us how to use the new ideas. Scientists have known about the idea of electricity for hundreds of years. But it wasn't of much use until the light bulb was *invented*. Then people had to figure out how to make electricity cheaply. Next, they had to figure out how to get electricity into people's houses and into the light bulbs. That's technology.

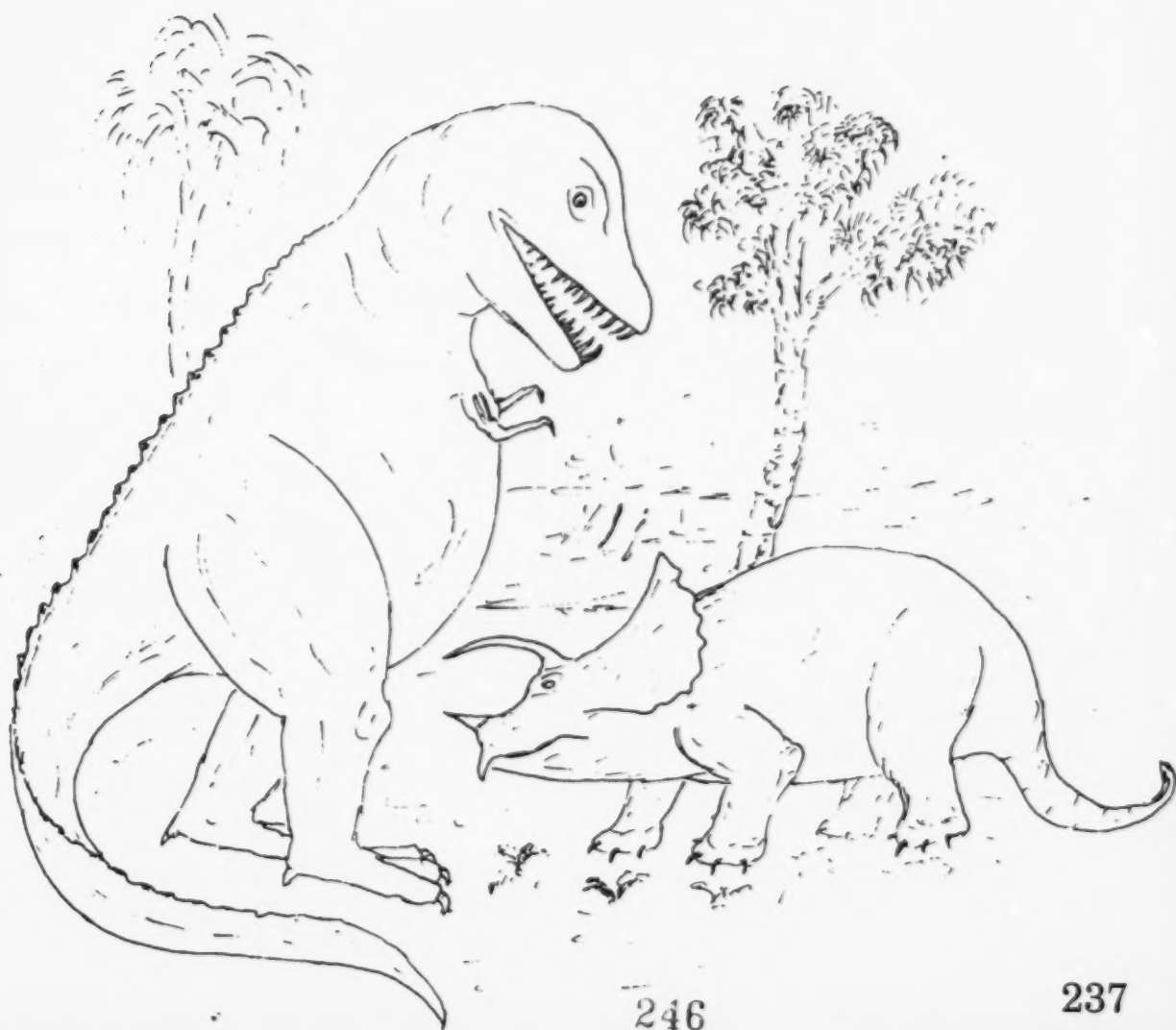
invention – the making of something new

- New ideas and facts in science are used to invent new things. The first **inventions** made work easier. Inventions like computers make thinking and learning easier.

The shovel, the wheel, and the plow were inventions of long ago. Then came water wheels, steam engines, and machines like typewriters and sewing machines. In the last hundred years, the car, plane, tractor, radio, and TV were invented. Now we have computers, satellites, VCR's, and digital watches.

extinct – no longer living

- Many groups of plants and animals that lived in the past are no longer living today. The dinosaurs are all **extinct**. Some of the trees and ferns we see as fossils in coal do not live now. There are many different reasons that living things become extinct. Any large change in the natural world can cause extinction. One cause is climate change. For example, if a forest slowly becomes a desert over thousands of years, plants and animals may change, or evolve, to fit the new climate. But some plants and animals may never change enough to fit the new climate. They die out (become extinct).



Many plants and animals have become extinct in the last 200 years. People have caused most of these recent extinctions. Several kinds of orchids have become extinct in the Appalachian Mountains because the virgin forests have been cut down. There were once many millions of passenger pigeons in the U.S. They disappeared from our skies completely by the 1880's because of hunting. In the early 1800's, around 60 million buffalo (American bison) lived on the American plains. Almost all of them were killed by hunters by 1890. But even if they had not been killed, the huge herds of buffalo could not live today because the grasslands have been fenced and planted with crops.

Even electric power plants have caused extinctions. They take large amounts of water from rivers and lakes for cooling. The warmed water is then returned. This change in temperature may cause some fish to die. When TVA builds a dam for hydroelectric power, some of the fish that live in the clear rivers can't live in the new lakes. They become extinct. The fish that can live in lakes take over.

ancestors – the people you came from in the past

- Your grandfather, great-grandfather, and great-great-grandfather are all your **ancestors**. Way back in the past, your ancestors may have been Indian, English, German, or African.

cells – a very tiny single bit of living stuff of which all plants and animals are made

- Our bodies have nerve **cells**, fat cells, bone cells, blood cells, and many other kinds of cells. Most cells are so small you can't see them without a microscope. Cells are the "building blocks" of life – a brick is to a building what a cell is to a living thing.

Everyone Is a Scientist

"The more I find out, the better it is. I like to find out."

Richard Feynman, Nobel Prize winner

Anyone can be a scientist. You don't have to go to college. You don't have to know a lot of big words. Scientists learn to make decisions based on facts and careful observations. To be a scientist, you have to use what you know to make good decisions. If you plant your garden seed at the right time, you are a scientist. If you stop smoking because of the danger to your health, you are a scientist. If you know how to fix your car, you are a scientist. If you make sure your children brush their teeth, you are a scientist. If you wear seat belts, you are a scientist. You are using the facts you know to make smart decisions.



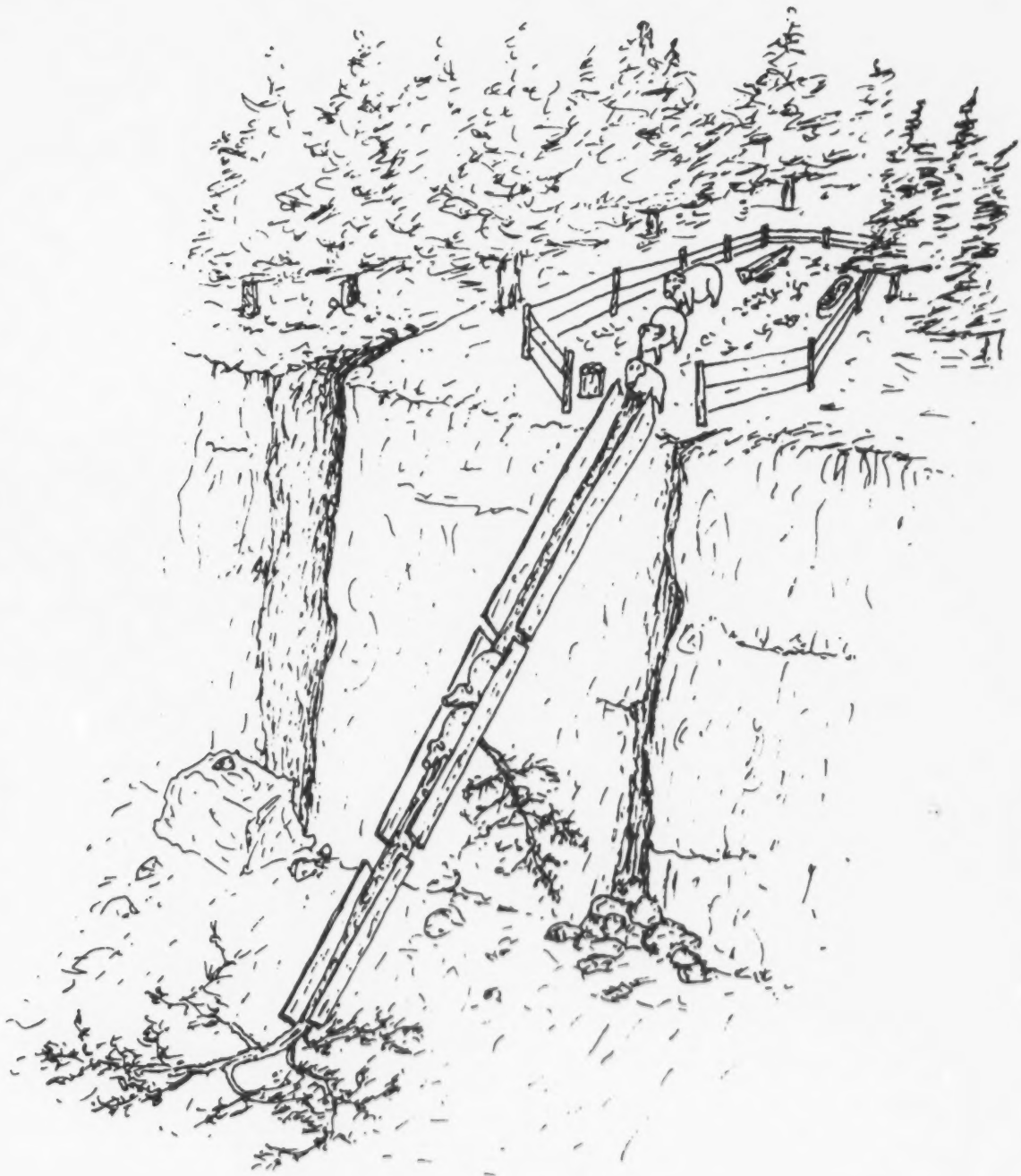
Science is not a new thing. People have tried to learn about nature and how things work for thousands of years. Peter Severinus told his students how to become scientists over 400 years ago. This was his advice.

“Go, my sons, sell your land, your houses, your jewelry, and your clothes. Buy yourselves strong boots, go away to the mountains, search the valleys, the deserts, the shores of the seas, and the deepest places of the world. Study the differences between animals, the differences between plants, the different kinds of rocks, the properties and source of everything. Don’t be ashamed to learn about the earth, the moon, and stars from the old people and farmers. And then buy coal, build furnaces, watch and experiment without tiring. In this way and no other will you learn about things and their properties.”

George Cagle: An Early Sequatchie Valley Scientist

There have always been lots of scientists in the Sequatchie Valley. George Cagle was one of them. He was a smart man. He liked to invent new ways of doing things. He figured things out like a scientist. He was also very good with animals. D. Wooden remembers him well.

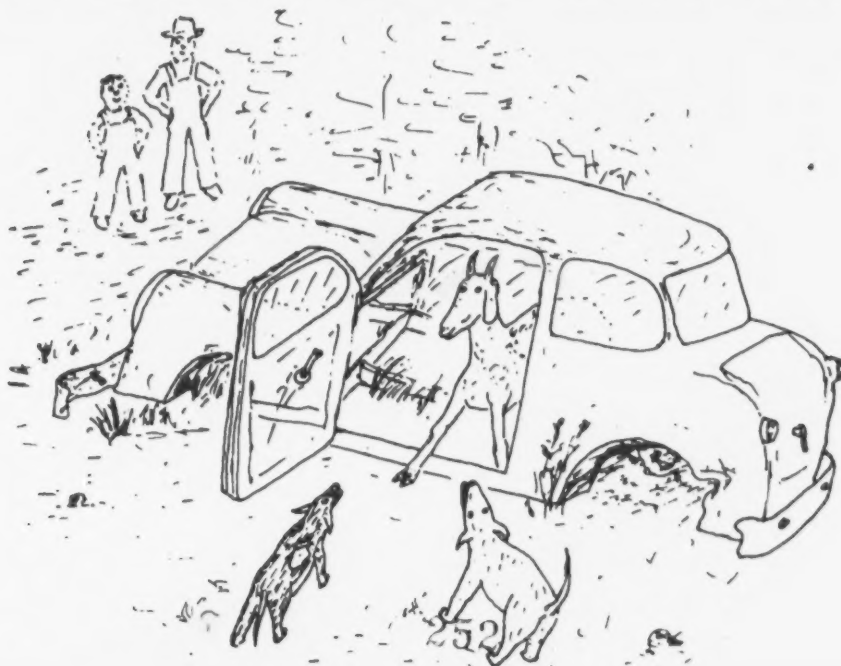
D. Wooden: "George Cagle lived right at the top of the mountain. He could do anything with animals. He raised hogs. He let them run free. He wanted them to feed on the acorns and roots down on the side of the mountain. But the hogs couldn't get off the bluffs. So he penned a bunch of them up right on the edge of the bluff. He cut a tree so it'd fall over the edge of the high bluff. He leveled the log and boxed it in on the sides with boards. He fixed a gate up in the pen so the only place the hogs could go was down that log. He'd get the hogs started



down it. It was too steep for them to turn around and come back up. The boards kept them from going over the side. When those hogs got started, they'd go right down the log.

"He'd leave them down there to feed on the acorns and such in the woods. Then he'd go down and call them and bring them back up the mountain on a trail. He'd just call them and throw down a little corn. They just followed him up. Those hogs would do anything he'd tell them to. I believe he could have taken them through Atlanta, Georgia.

"He'd send his dogs off hunting. He'd say, 'Blackie, go on a hunting,' and they'd just take off. We was up there one time. George said to my boys, 'Boys, you gotta train your dogs.' He said, 'Blackie, go hunt up the goats. Bring the billy goat in here.' Those two dogs took off. They were gone about 30 minutes. George had an old car body setting there. The doors was open on it. Here come the dogs with the goat. Cagle says, 'Put him up. You know where

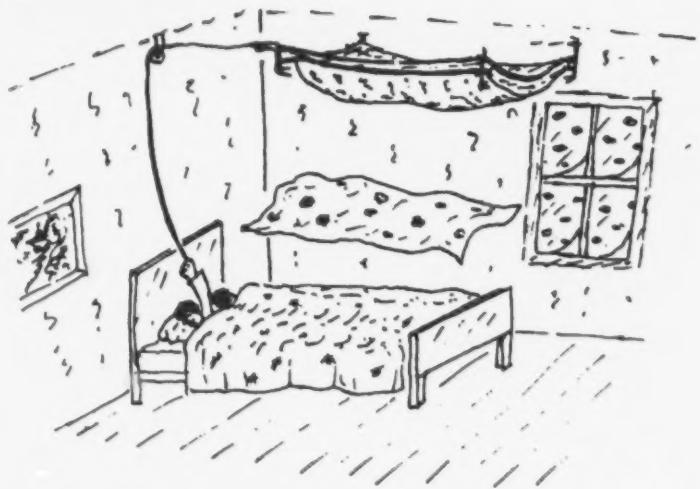


he goes.' That goat went in that old car. The dogs kept him in till Cagle went over and closed the doors. Beat anything I ever seen.

"He made a washing machine one time. It had a crank to pull the clothes through the wringer. He used barb wire. He said, 'My wife Bell wouldn't use her clothes to try it out. Bell's pretty smart. I put mine through, and buddy, it about tore them up!'

"His clothesline run through pulleys to a tree. He'd stand on the porch and hang up the clothes and just pull them out. Then he'd take the dry ones off the other line as he pulled it in.

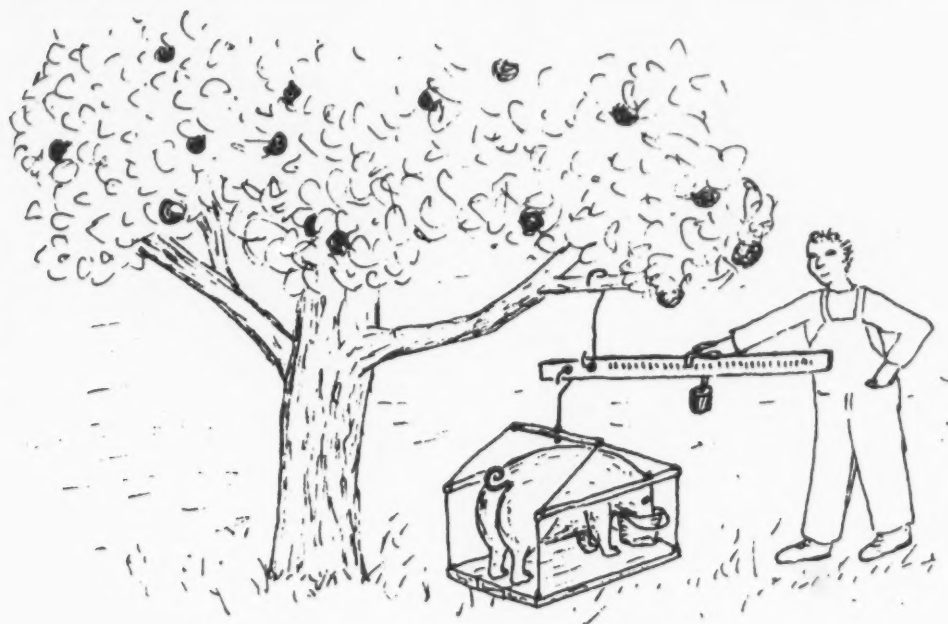
"His house was pretty cold. He had a stack of quilts slung across the roof above his bed. There was a rope tied by the head of his bed. If it was cold and he wanted another quilt, he'd just reach over to the rope and let it right down on him.



"He had a oil drum in his fireplace with the ends cut out. He burned slabs from the sawmills. He'd just let them stick out in the room. There'd be a pile

of ashes out on the wood floor. That fire would just burn on top of those ashes. He told me, 'Yeah, yeah. More ashes, better protection!'

"One time he was raising some pigs to sell. He had a set of scales, called steelyards, with weights. He hung the scales on a apple tree limb with a chain running down to an oil drum. One end of the drum was open. It just cleared the ground. He'd put a half



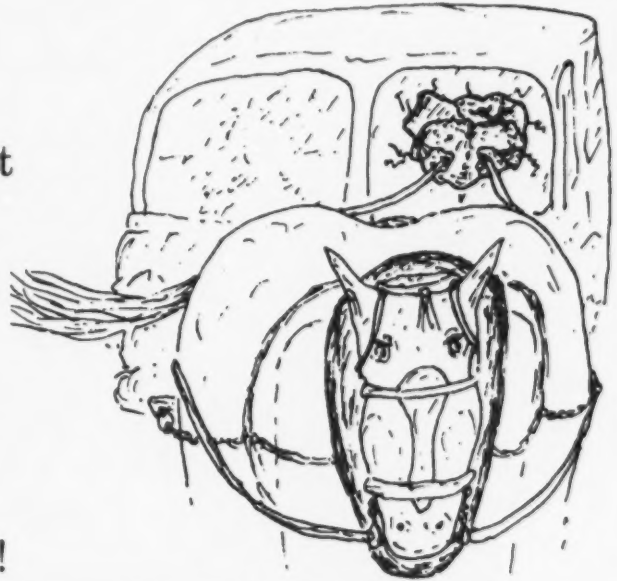
gallon of slop in the drum. He knowed what that weighed. He'd put a pig in the drum to eat that feed. He'd find out how much it was gaining in a day. He'd fool with something like that for a month to get it fixed up, and it'd work. All but his clothes wringer!

"He just had 50 cents when he built his house. So he bought a keg of rusty ol' nails to nail the roof on. Rest of it was logs. Didn't have no nails in it. All the logs was notched. It was a big two-story house.

"He had a great big rock near the top of his chimney. It was a tall chimney. I bet that rock weighed a thousand pounds. I got to wondering how in the world he got that rock up in the top of that chimney. He told me he sledged it up. He said, 'I had plenty of help. Had a big family. As I built the chimney, we piled up dirt on one side of it for a scaffold. Kept wheelbarrowing the dirt up. Then we just drug that rock up there with ropes.'



"He had a little ol' Austin car. It run when he bought it, but he wouldn't drive it. He took the motor out, put shafts to the front end to hitch a horse to. Turning the horse would turn the front end. He knocked part of the windshield out to put the reins through. Him and Bell would sit in the front seat holding those reins. They'd drive it to church. They was in style!



"He was an all-round man. He'd trade, he'd preach, he'd have prayer meetings. He'd make a little wine to sell. He'd made a bunch of wine when we was over there once. He'd had a prayer meeting just the week before. He dragged stuff out from under his bed till he got to the jugs. He'd want us to try a little of this, a little of that.

"He wanted to hold a revival once and preach about the different churches. He said he didn't know which one was right. He wanted to preach on that. Not putting down any one. He didn't claim to belong to any one. He wanted to preach at the Church of God down here. He thought it would be

a handy place for people to come to. The deacon said, 'No, you ain't coming in and tearing our church up.' Mr. Cagle just patted the deacon on the shoulder and said, 'There must be a little doubt somewhere in your mind. If your ways is right, your church ain't a going to get tore up! Ever thought of that?'

"He walked ten miles every day. Said he had to get his exercise. That was when he was in his 80's. Never knew him to go to the doctors. He died when he was 94 years old."

Podney – A Modern Scientist

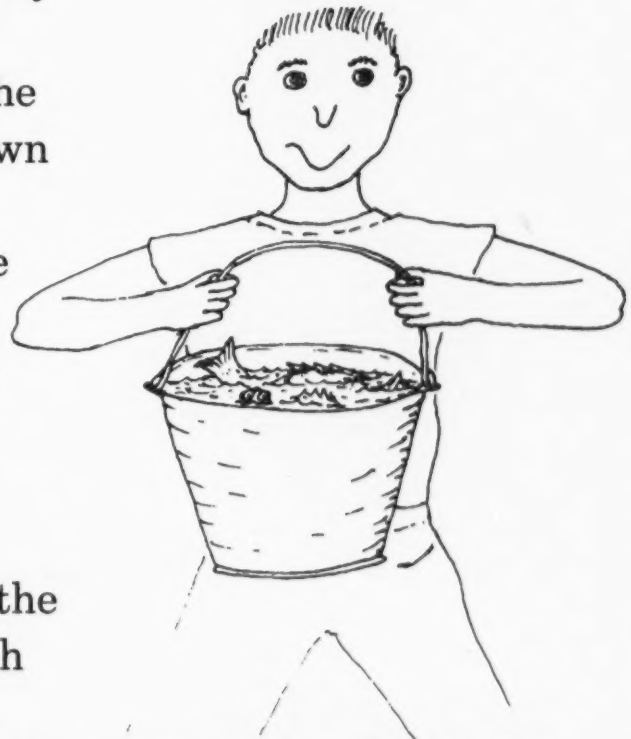
Podney Jones owns a body shop in the Sequatchie Valley. His neat and beautiful farm shows a lot of scientific thinking. He has built a large fish pond near his house.

Podney: “There are layers of limestone rock under the ground here. There’s all sorts of water in that limestone about eight feet down. Until I dug this pond, they didn’t know all that water was under the ground. This pond is fed by the limestone springs.

“I wanted to *balance* the pond. I got kids to go down to the river and catch bream. They brought me hundreds! Had to get them to stop. Then I got them to bring me bass. They didn’t bring me many bass!”

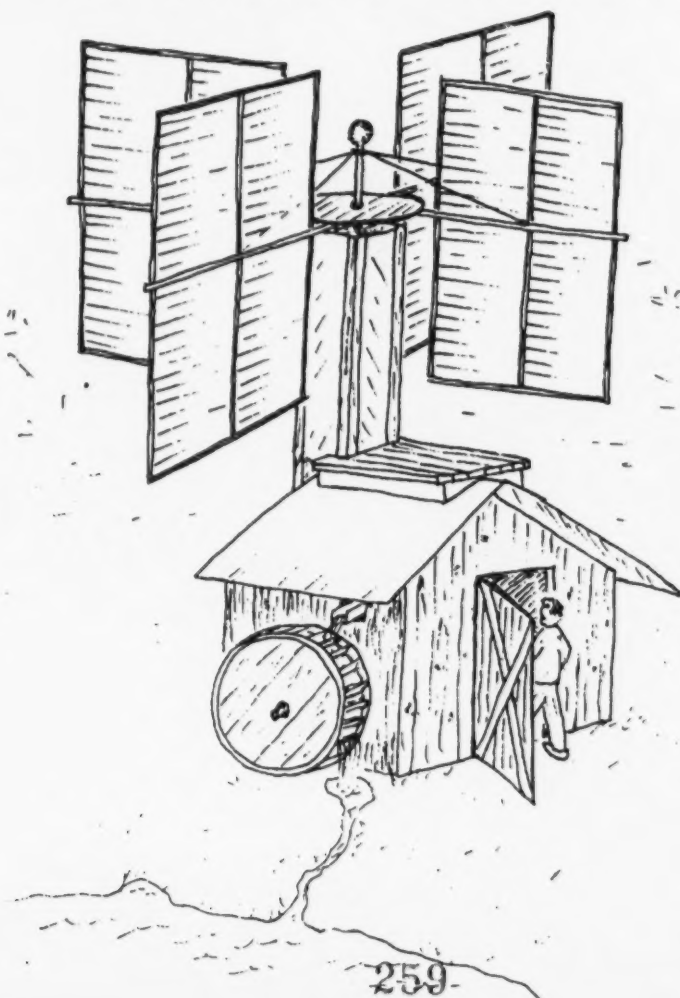
He also has catfish in the pond. He grows more fish than his family can eat.

Podney is an inventor. He has a number of patents on his inventions. A patent gives an inventor



the right to make and sell his invention. No one else is allowed to make or sell that same invention.

One of his inventions puts more water into his pond. He has a well next to the pond. He and his son put up a wind machine. It has four large panels on it. The wind makes them turn. They are connected to a Chevy rear end. The rear end operates a belt. The belt operates a pump. The pump pulls the water up from the well and sends it into the pond. He has also built a little water wheel. The water from the well turns the water wheel. The



water wheel is connected to a grindstone. He uses it to sharpen his knives.

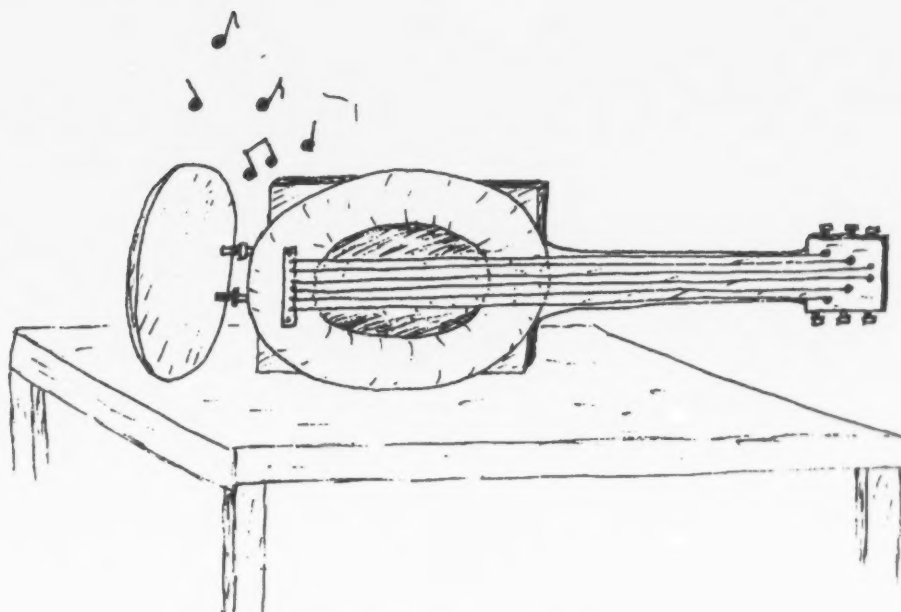
Podney has invented a new kind of motor. It doesn't use gas.

Podney: "I've got a patent for the first magnetic motor. It uses a battery. Builds 80 percent of the energy back into the battery. But we're not ready for it yet. Not until gas gets more scarce and costs more and more. It'd take \$10 million to develop it.

"I made a butterfly valve that takes the place of a carburetor. I can get 100 miles per gallon in a Mazda with it. But they wouldn't give me a patent on it. Said it wasn't safe. It's safe the way I make it. What it's not safe for is the gas sellers!

"I built a machine that takes the water out of air after it goes into an air compressor. Keeps the moisture out of the air lines."

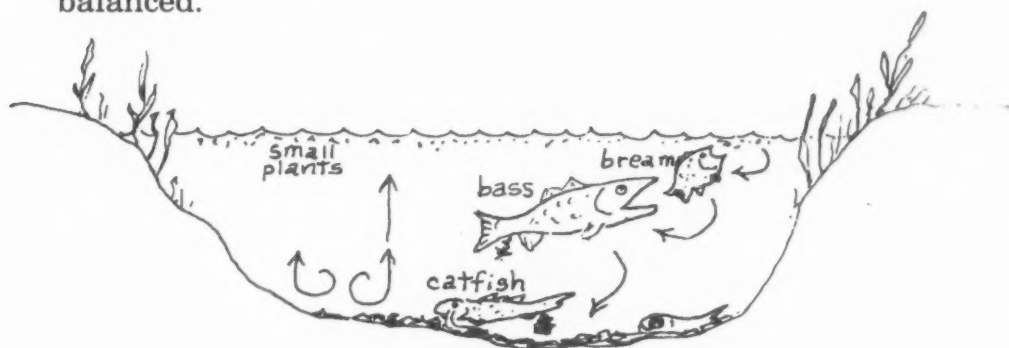
Podney also likes to have a good time. He likes country music. He plays his own special invention. It looks like a banjo. It also looks a lot like a toilet seat! When he lifts the lid, you can hear the toilet flush. Then he starts strumming. The head of the banjo really is a toilet seat with a small tape player inside it. Lifting the lid starts the tape player. The flushing sound and the music are both on the tape. He's a big hit at country music shows!



Information, Please

balance – to keep steady; all parts have the correct relationship to each other

- If a pond isn't **balanced**, the fish will die. In a balanced pond, you can have bream, bass, and sometimes catfish. Small green plants grow in pond water. The bream eat the plants. Then the bass eat the bream. The catfish eat the dead stuff that falls to the bottom. If there aren't enough bream, too many plants will grow. The plants will use up all the air in the water. The bass will die. If there aren't any bass, there will be too many bream. They will eat all the plants and then starve. If there are too many bass, they will eat all the bream and then starve. If there is just the right number of each kind of fish, the pond is balanced.



Think Like a Scientist

There are lots of people who don't think and act like scientists. Poor old Lester wasn't much of a scientist. D. Wooden tells about a mean trick they played on him once.

D.: "Lester was as afraid of a lizard as he could be. Just a little ol' blue striped lizard. We called them streak fields. Lester'd shoot a lizard with a shotgun just as quick as he would a bear, boy. He was crazy.

"Once Lester was going across a field following a cow path. There was one of them ol' streak fields just a rared up looking at him. Big hog-headed thing. I asked him what he done. He said, 'I stopped as quick as I could. I just eased around and run.'

"I said, 'Did it run you?'

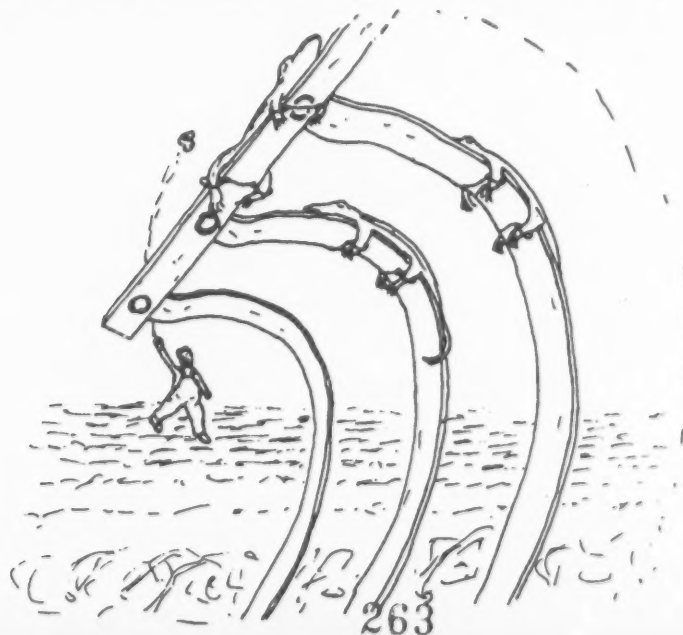
"He said, 'I kindly looked back over my shoulder. It was right on my heels. I jumped just as high as I could. It kindly run under me!'



"One day me and J. D. was following a rail fence near a field where Lester was raking hay. There was a lot of lizards on that rail fence. We both had flips (sling shots). J. D. said, 'Let's kill us a bunch of lizards. When Lester goes to dinner, we'll put them on his rake.'

"We just tied them lizards all over that rake. They was dead, of course. Then we went and hid in the woods and watched. Well, Lester seen them before he got to the rake. He stopped his mules about 30 foot from the rake. He wouldn't get no closer. He looked and looked at that rake. Then he turned around and took the mules back to the woods. He tied them up. He went back to the field.

"He throwed every rock he could find till he knocked those lizards off. It was hot and the sweat was just pouring off of him. He was a big fat feller. It was an hour or two before he got those mules



hooked up to the rake. And us laying over there in the shade a laughing at him. But I'll tell you what, he never did know that either."

Coy Lee's daddy didn't think much like a scientist. **D.:** "Coy Lee once made big shoe prints out of a plank. Had heels and everything. He walked on them. Looked just like great big footprints. He walked all around the edge of the pond and through the corn field. He even told his dad he'd seen Big Foot. Why, the word got around. Different people told about seeing those prints for miles around. They saw them in places where Coy hadn't ever been. When his daddy found out, he said, 'I don't know why those boys would want to pull a prank like that on their old daddy!' "



Science Mysteries

There are some things that science can't seem to explain. Scientists have studied water witching for years. They can't find any scientific explanation for it. But it seems to work.

Some of the old people in the Sequatchie area like Charlie Clark and Arley Laymon say they have the gift of healing. They can stop bleeding, cure thrush (a rash in babies' mouths), and cure warts. Doctors and scientists don't know how this works.

People in Tennessee have been planting by the moon and the signs for many years. There's no scientific reason for it. But the old-timers think it works.

Arley Laymon plants a large garden each year. He is very careful to plant at the right times. He keeps a record of when he plants. That way he knows how well the crops grow. That's thinking like a scientist.

Arley: "I always plant by the moon. If you



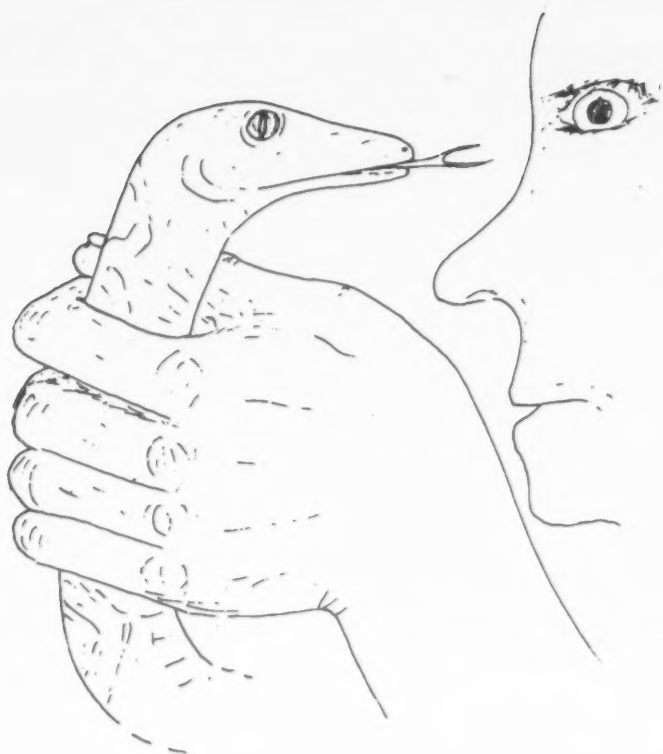
don't, you don't raise nothing. Potatoes – can't plant them in the new of the moon. If you do, you just get one tater at the bottom of the vine. After a new moon is three days old you can plant. Or you can plant three days before the new of the moon.

“Corn's the same way. If you plant on the new of the moon, it'll go up about 14 feet high. Just little bitty ears sticking straight up on the stalk. Beans, they'll just keep running. Won't have as many beans. I never would plant nothing on the new of the moon. First or second quarter is all right. Cucumbers you plant when the signs is in the arms.

“Take a tree you want to kill. Just drive a nail in it on one of the three dark nights in May, when there's no moon. It'll kill it right down to the roots. You can cut a ring around a tree on those nights, that'll kill it, too.”

Sometimes people think religion explains things science can't. A few church groups in the mountains of Tennessee pick up copperheads and rattlers during their church services. They think God keeps the snakes from biting them.

The pastor of one of these churches said, “We just handle them. No one has ever got hurt. We feel like if God makes you feel good enough to handle them, you can.” He has handled snakes for 50 years. He



has been bitten five times. "But it never did as much as swell me."

This is the Bible verse they quote: "Believers will cast out devils in my name and speak in strange tongues; if they handle snakes or drink any deadly poison, they will come to no harm" (Mark 16: 17-18).

A few people in these churches have died from snake bites. Some have also died after drinking poison. But that doesn't happen very often.

Scientists who work with snakes don't really know why these people don't get bitten more often.

Science: Problems and Solutions

Science and technology have given us easier lives. But with the gifts of science have come problems. Cars take us everywhere quickly and easily. But they pollute the air and sometimes hurt or kill people. Factories make beautiful clothes, TV's, soaps, and cars. Almost everything we own was made in a factory. But they can pollute the air and water. Nuclear power plants give us electricity. But they also give us dangerous radioactive waste.

Science developed packaging to keep foods fresh and clean. But old cans, bottles, and paper can destroy the beauty of our valleys and mountains. Science has given us new and better weapons to protect our country. But those weapons are so strong they could destroy all living things on our beautiful earth – that includes us!

Science has also given people ways to solve these problems. We have seat belts, pollution controls, recycling centers, safe energy from the sun and water, and education. But people don't always use these gifts. Sometimes people just want to make more money and have a good time, with no thought for the future. Some people just want power and a strong government to protect their interests. They don't



seem to care about having a clean, safe, and natural world for their children to grow up in.

Sometimes the ideas and inventions of scientists are used in bad ways. When gunpowder was first invented, it was used only for firecrackers. The inventor never thought it would be used to kill people. Often the advice of scientists is ignored. Einstein was the scientist who discovered the ideas that led to the atomic bomb. He was a very good man who loved peace. He did not think the atomic bomb should ever be used on people.

The space shuttle blew up and killed seven astronauts in 1986. The decision to *launch* it was not made by scientists. They told the space agency not to launch the shuttle in cold weather, but it was launched anyway. Also, poor building methods or workers who make mistakes sometimes cause accidents at nuclear power plants and factories.

Some people blame science and scientists for the problems of the world. It's easy to forget that science has given us cars, roads, airplanes, lights, warm homes, safe food, and healthy lives.



We need all the help we can get from science to carry us into the 21st century. Scientists and all the people of the world will have to work together to develop ways to live *sustainably*. We are all responsible for solving today's problems and for planning a better future.

The Price We Pay

When Arley Laymon (p. 61) and George Cagle (p. 263) were young men in the Sequatchie Valley, life was very simple. People walked or rode horses. They didn't own much. They made most things they needed. For entertainment they visited, talked, and sang. They grew most of their own food. We live very different lives today. Not many people want to go back to the old ways. But we are paying a high price for this easy life. The air is no longer clear. It's not safe to swim in lakes or rivers. It's not even safe to be in the sun. There are very few places on earth that have not been changed by people. Savage Gulf (p. 164) is one place we can still see true *wilderness*.

The Indians understood the meaning of nature and wilderness. They were good scientists. Here is what Chief Seattle said in 1854. He was telling the President why the Indians didn't want to sell their land to the white man.

How can you buy or sell the sky, the warmth of the land? The
idea is strange to us.
If we do not own the freshness of the air and the sparkle of the
water, how can you buy them?
We are part of the earth and it is part of us.
The perfumed flowers are our sisters.
The deer, the horse, the great eagle, these are our brothers.
We know that the white man does not understand our ways.
One portion of land is the same to him as the next.
He is a stranger who comes in the night and takes from the
land whatever he needs.

The earth is not his brother, but his enemy.
When he has conquered it, he moves on.
His appetite will devour the earth and leave behind only a
desert.

The sight of your cities pains the eyes of the red man.
But perhaps it is because the red man is a savage and does not
understand.

There is no quiet place in the white man's cities.
No place to hear the unfurling of leaves in spring or the rustle
of an insect's wings.

The clatter only seems to hurt the ears.

And what is there to life if a man cannot hear the lonely cry of
the whippoorwill or the arguments of the frogs around a
pond at night?

The Indian prefers the soft sound of the wind over the face of a
pond, and the smell of the wind itself, cleaned by a midday
rain, or scented with pines.

The air is precious to the red man, for all things share the
same breath – the beast, the tree, the man.

The white man does not seem to notice the air he breathes.
Like a man dying for many days, he is numb to the smell.
If we sell you our land, you must remember that the air is
precious to us.

If we sell you our land, you must keep it apart, as a place
where even the white man can go to taste the wind that
is sweetened by the meadow's flowers.

One thing we know, which the white man may one day
discover – our God is the same God.

The earth is precious to Him, and to harm the earth is to heap
contempt on its Creator.

The whites too shall pass; perhaps sooner than all other tribes.
Contaminate your bed, and you will one night suffocate in your
own waste.

Your destiny is a mystery to us, for we do not understand
when the buffalo are all slaughtered, the wild horses are
tamed, the secret corners of the forest heavy with the
scent of many men, and the view of the ripe hills blotted
by talking wires.

Where is the thicket? Gone.

Where is the eagle? Gone.

The end of living and the beginning of survival.

The more we learn about nature, the more we see that Chief Seattle was right. In order to survive, we have to learn to respect nature. Perhaps in the future, science can help us to live good and *sustainable* lives without destroying the wonder and beauty of the natural world around us.

Information, Please

launch – to set moving

- Rockets and spaceships are **launched** into space at Cape Canaveral, Florida.

sustainable living – a way to satisfy the needs of people without damaging the environment and without using up the world's resources

- Ways to live **sustainably** include using less gas and oil, recycling paper, glass, and plastic, buying fewer things that have to be thrown away, preventing the extinction of rare plants and animals, and working with nature instead of destroying it.

Sustainable living means that our children and their children will have what they need to live on our beautiful earth.

In 1995 the President's Council on **Sustainable** Development was held in Chattanooga.

wilderness – a wild and natural place

- The government sets some natural places aside as **wilderness** areas. No one is allowed to mine, hunt, cut trees, build roads, or live in these areas. The wilderness areas are left for the wild animals and the forest.